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F. A. ARMSTRONG, . . . . ., *Secretary*.

# THE BOARD OF REVIEW

OF THE CITY OF CINCINNATI.

REPORT OF GEO. McLAUGHLIN,

SPECIAL EXAMINER,

IN REGARD TO THE AFFAIRS OF THE

# CITY WATERWORKS

MADE

DECEMBER 2, 1892.

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CINCINNATI:

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OFFICE OF THE BOARD OF REVIEW,  
CINCINNATI, December 17, 1892. }

The Board of Review, acting as the City Board of Revision, received a report from Mr. Geo. McLaughlin, previously appointed to examine into the affairs of the City Waterworks Department. Said report and accompanying documents were referred to a Special Committee, consisting of Messrs. Strunk and Krohn, whose report to the Board is appended. The report was approved and adopted by the following vote: Ayes—Doherty, Hemmelgarn, Krohn, Strunk, and the President.

It was further ordered that this report and the report of Mr. McLaughlin, together with the accompanying documents, be transmitted in accordance with the law to the Board of Legislation and printed in pamphlet form.

p 44935

# REPORT OF THE COMMITTEE.

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CINCINNATI, December 17, 1892.

THE BOARD OF REVIEW :

*Gentlemen,*---Your committee appointed to review the report of Examiner McLaughlin on the management of the Waterworks Department of this city presents the following :

## I.

The report appears to be full and comprehensive, showing that a vast amount of labor, combined with great skill and fidelity, have been expended upon the same.

## II.

The analysis made of the official report for 1891 shows glaring mistakes as to tons of coal used, the cost of same, and gallons of water per inhabitant, as evidenced by the following table :

	Stated in Report.	Actual Amount.
Tons of coal used.....	43,997	53,186
Daily average in tons.....	61.84	145.71
Cost of coal, per ton .....	\$2.80	\$2.47
Gallons water per inhabitant.....	199.67	138.09

Comment is unnecessary.

## III.

The payment in March (1891) of \$2,502.52 as an excess allowance on coal delivered, in direct opposition to the advice of the Corporation Counsel and an injunction issued by the courts, as well as further excessive payments of \$2,101.32 on coal purchases, and the fact that nut and slack coal were purchased during the early part of the present year at the same time from two firms—the one firm being paid \$1.93

per ton and the other \$1.75 per ton—are all indications, in the absence of other knowledge upon the subject, that in these particulars very loose methods have prevailed. The manner of executing coal contracts appears incomprehensible when ordinary business principles are applied to them.

## IV.

The reported violation of the law in not advertising for the purchase of supplies necessary for the department has, in addition to the pernicious effect upon the people at large of a violation of the law, apparently cost the city a considerable sum of money. The law as to advertising for all supplies amounting to \$500 or more should be strictly complied with. The only exception to making purchases in these amounts would appear to apply to articles where violent fluctuations in values are of frequent occurrence, when the best interests of the city may occasionally be served by buying oftener and in smaller amounts.

## V.

The increase in the sums of the annual pay-rolls from 237 men and payments amounting to \$164,736.64 in 1882 to 499 men and payments amounting to \$373,167.70 in 1891 is something enormous. It shows the increase in pay-rolls to amount to 126 per cent, while the increase in water-rents for the same years is only 41 per cent. It is furthermore out of all proportion to the growth in population during these years, bears no relation whatever to the increase in the tax duplicate, and apparently furnishes a basis for the belief that there has been needless extravagance or careless management, or both. A comparison of the total receipts and expenses for the same years (1882 and 1891) presents a still stronger contrast.

	Water Rents.	Total Expenses and Betterments.
1882 .....	\$507,501 31	\$331,094 71
1891 .....	719,109 15	834,132 90

In other words, while the receipts have increased \$211,607.84, the expenditures have increased \$503,038.19, seven tenths of which sum is an increase in the running expenses of the department. The further fact that each application to turn water on or off costs the Waterworks Department two dollars against forty cents to fifty cents paid by the

Cincinnati Gas Light and Coke Company calls for an immediate remedy.

## VI.

The decrease in the consumption of fuel in the ten months ending November 1, 1892, amounting to 5,376 tons, at a saving in cost of \$26,102.35, is most commendable. The total reduction in current expenses for the same period is \$137,365.72, and appears like the dawning of a new era. This is proof positive that a way has at last been found by which betterments, including a new pumping engine and boilers to suit for the Front-street house in 1893, can be provided without resorting to an issue of bonds for the purpose.

## VII.

The report of the Examiner clearly shows that sundry improvements and devices introduced by Mr. Tharp, the Waterworks Superintendent, have brought about large savings, and that he deserves praise for his untiring devotion to duty. The general management for the current year, aside from the apparent irregularities in the reported purchases of coal referred to above, has been a decided improvement upon that of recent years, and leads us to hope that the Board of Administration, with a determined purpose, can and no doubt will effect still larger savings, and that the tax-payers may get relief by a reduction in the water-rents.

In conclusion, we report that in the interest of the tax-payers no contract of any kind should be signed on behalf of the Waterworks Department until the Corporation Counsel has certified in writing that the same meets every legal requirement; no changes in contracts should be permitted, excepting upon the written advice of the same official, in regard to the effect of the proposed changes; and under no circumstances should the interests of the city be prejudiced by releasing sureties from their obligations.

Respectfully submitted,

WM. STRUNK,  
LOUIS KROHN.

## SUMMARY OF REPORT OF EXAMINER.

The report begins with a formal review of the Accounting Department, extending from p. 13 to p. 16. The survey bills reach 58,000. The entire number of bills of all kinds, including meter, elevator, and building-permit bills, amounts to 85,000. The increase of survey bills for the year 1891 was seventeen per cent; the meter and elevator bills twenty per cent. The uncollected bills of all classes did not reach \$250 in amount, or one twenty-ninth of one per cent of the entire water-rents, \$733,905.35.

Attention is called, on p. 17, to the fact that it is the expenditures, not the receipts, that call for examination. Since 1882 there has been an increase from \$128,610.36 to \$466,380.42, or 264 per cent; while the water delivery, as stated in the reports of the department, has increased only 115 per cent. No economy has been found in the greater volume, as ordinarily occurs in the experience of private corporations. The greater number of gallons has been pumped at an increased cost per gallon—viz.: \$18.10 per million gallons in 1882, and \$30.03 in 1891.

The official report for 1891 is analyzed on pp. 18-21, and the errors that are discoverable on the face of the returns are as follows:

	Stated in Report.	Actual Amount	Difference.
Tons of coal.....	43,997	53,186	9,189.
Daily average in tons.....	61.84	145.71	83.87
Cost of coal during year .....	\$131,775 00	\$131,885 14	\$110 14
Cost of coal per ton .....	2 80	2 47	33
Gallons water per inhabitant...	199.67	138.09	61.58



Reasons for the belief that the deficiency due to the imperfect filling of the pumps in the Front-street Station amounts to twenty per cent or more are given on pp. 19-20.

Mr. Tharp's intention to measure the water, in 1892, by means of a weir is set forth on p. 20, and the device described. Reasons are given on pp. 20-21 for limiting the annual increase in the water delivery to nine per cent by a reference to the increased area of the service branches between 1882 and 1891, which amounts to 7.20 per cent annually during the period.

The effect that previous exaggerated statements in regard to the water delivery and other matters have had in forcing the present management into the awkward position assumed in the report of 1891 is commented upon on p. 21.

Under the head of Coal Contracts, the details are given on pp. 22-24, in relation to a payment by the Board of Improvements, as one of its first official acts in returning to power in March, 1891, of the sum of \$2,502.52 as an excess allowance on coal already delivered—the payment being made in defiance of the opinion of Theo. Horstman, Corporation Counsel, and in disregard of an injunction issued by the courts.

Under the same heading, on pp. 24-25, will be found the details of excess payments, amounting to \$2,101.32, made on coal purchased from other dealers on account of the refusal of the Superintendent to receive the coal delivered by the Consolidated Coal and Mining Company, the coal furnished under their contract not being of the required quality.

The same division of this report shows, on pp. 22-26, the payments made during the early part of the present year to the Consolidated Coal and Mining Company of \$1.93 per ton for nut and slack coal, when it appears by the bills that coal of this kind was purchased at the same time from W. H. Brown & Sons at \$1.75 per ton, the excess payments amounting to \$404.35, and the bills therefor exceeding in several cases the sum of \$500, fixed by the law as the limit of the purchase of supplies not made under contracts duly entered into after advertisement for bids.

The careless manner in which the contracts for coal have been made, and the difficulties encountered by the Superintendent in forcing contractors to sign the agreements after the awards had been made, are matters set forth on pp. 26-27. A summary of the features



of the coal contracts is given on p. 27, and a detailed statement of the coal bills in 1891 and 1892 appears on pp. 27-28.

A remarkable decrease in the consumption of fuel in the ten months ending November 1, 1892, is commented upon on p. 28. Decrease in number of tons 5,376, or 14.30 per cent; decrease in cost \$26,102.35, or 28.30 per cent. The reduction in coal bills during the entire year stated at the same rate would amount to \$33,592.55.

In the record kept at the Front-street Station of the number of gallons pumped, there is a reduction in the nine months in 1892 amounting to 11.25 per cent, in despite of an increase of 3,952,585 in the number of revolutions made by the large engines within the pumping house that is equal to 17.39 per cent. The foundation for the decrease is found in the statistics in regard to the auxiliary engines.

This statement in the record, although made against the management, has no foundation in fact, as the water in the Eden-Park reservoir was maintained at its full height in 1892, while the reservoir was far from being full during a number of days in 1891. The errors in the official statement may be ascribed partly to the greatly-improved condition, in 1892, of the engines within the pumping house, and partly to the exaggerated claims set up in regard to the performance of the auxiliary engines—the sum of the exaggeration being proportionately greater in 1891, by reason of the fact that these engines were used during nine months in that year and only during three months in 1892. (Pages 29-30.)

On p. 31 the economy in the fuel is ascribed chiefly to the feed-water heater introduced in the beginning of 1892. The excess of 14.30 per cent reduction in the tons of coal consumed, over 12.09 per cent, economy the greatest possible amount due to the heater, is attributed to the use of the Stirling boilers, first used during the present year. These boilers consume nut and slack coal at a cost of \$1.63 per ton, instead of lump coal at \$2.21 per ton. A diminished use, in 1892, of the auxiliary engines, operated at an extravagant expenditure for coal, has also contributed to the economy shown.

An increased consumption of coal at the Hunt-street Works in 1892 is shown on p. 32, amounting to 263 tons, or 8.58 per cent. This is justified by an increase of 11.63 per cent in the amount of

water pumped, together with an increase from 13.65 revolutions of the engines per minute in June, July, August, and September, 1891, to 15.97 revolutions per minute in 1892. A feed-water heater, delivering water at 180 degrees, was in use during both years. (Page 34.) As the pumps are filled at every stroke by a pressure from the Eden-Park reservoir amounting to twenty pounds per square inch, the statistics at the Hunt-street Works can be depended upon as entirely accurate returns of the water delivered. (Page 33.)

A detailed statement of the defects of the engines and pumps in the Front-street Pumping House, and a reference to the capacity of certain engines as steam-wasters, is given on p. 35. Notice is taken of the fact that the Worthington and Wetherill engines are the only double expansion engines in the house, and have the only cylinders provided with steam jackets. Triple expansion engines are recommended, provided the speed attained in marine engines is not a necessary part of the economy of their use. (Pages 36-37.)

The greater inefficiency of the pumps as compared with the steam cylinders is referred to on p. 37. The delay arising from the length of time necessarily devoted to taking apart, repairing, and repacking very large-sized engines is believed to offset the advantages derived from their greater size (p. 37). The bad economy of the auxiliary engines is referred to on pp. 37-38.

The effect of the introduction of a steam capstan by the present management is favorably commented upon; the advantage of the separation of the coal is questioned, and Mr. Tharp's method of conducting repairs is advocated on p. 39.

Covered canals for the intake, instead of tunnels, are suggested on p. 40, on account of the opportunities they would give for dredging the accumulations of mud at less cost.

Four purchases of lead, made in evasion of the \$500 limit, are detailed on pp. 40-42. The plea that it is impossible to conduct the city's affairs without violating the provisions of the law is considered on p. 42. The saving that could have been made if the law had been complied with in the purchases of lead in question is set forth on pp. 42-43.

The property leased by the department is described on p. 43, and the necessity for a Custodian of Public Documents stated.

The increase in the sum of the annual pay-rolls from 237 men and payments amounting to \$164,736.64 in 1882 to 499 men and

payments amounting to \$373,167.70 in 1891 is detailed on p. 44. Special items on pay-rolls 1882-1891 are compared on same page.

The eccentricities in the weekly payments on account of the inspection service, from 1882 to 1891, are set forth on p. 45. Each application to turn water on or off costs the department two dollars against forty cents to fifty cents paid by the Cincinnati Gas Light and Coke Company.

A comparative statement of current expenses is given on p. 46. The increase, amounting to \$30,470.64 on July 1, 1892, has been changed to a diminution of payments which shows a decrease of \$137,365.72 in the ten months ending November 1, 1892. In all the departments the expenses have decreased, with the exception of the stable and hydrant service—the former showing an increase of \$3,743.90 and the latter \$1,828.69 during the ten months specified.

On p. 46 will be found a detailed account of current expenses, and a statement in regard to the payments on account of betterments appears on same page. During the ten months \$166,888.24 has been paid for betterments against \$156,491.58 paid in 1881, notwithstanding the fact that no less a sum than \$200,000 was procured from the sale of bonds issued in July, 1891, to provide payment for this class of disbursements, while no money was obtained in the same way in 1892. (See p. 47.)

The current indebtedness may be estimated on p. 47 at \$48,541.19 (more or less), being the sum of the bills audited and unaudited filed with Mr. Keating, the book-keeper of the department.

An analysis of the stable accounts is given on p. 48.

Insurance policies have been placed on the stable buildings belonging to the owners of the fee—a clear waste of money, as nothing could be collected on account of this item of the policies in event of loss by fire. (Page 49.)

An increase in the water-rents, amounting to \$33,670.60, is reported in the ten months ending November 1, 1892. (See p. 49.)

The necessity of a new forcing main from the Front-street Pumping Works to the Eden-Park reservoir, at a probable cost of \$50,000, is referred to on p. 50.

The facility of investigation offered to the Examiner by the officers and employees of the department is mentioned on p. 50. The task

of investigating a business that does not fall very far below a million of dollars a year, and the necessity of confining it to a few important matters of expenditures in 1891 and 1892, is referred to.

A list of the various boards that have administered the affairs of the Waterworks during the last ten years is given on p. 51.

The lack of good management is attributed largely to the constant change and the lack of experience of officers and employees, and the want of interest that naturally follows situations held on so precarious a tenure.

# REPORT OF SPECIAL EXAMINER.

## THE BOARD OF REVIEW :

*Gentlemen,* — I beg leave to report an examination of the affairs of the City Waterworks, made by your order.

### THE ACCOUNTING DEPARTMENT SURVEY BILLS.

The surveyors make out and deliver the bills of this class to the consumers in the six districts into which the city is divided. As the bills are collected semi-annually, it follows that the making of the bills, their delivery and collection, constitute a formula of business that occurs in one of these districts during each month throughout the year.

A serious defect of the system is the unequal apportionment of the work between the months. The boundaries of the districts, as determined upon many years ago, are still maintained. As certain parts of the city have increased more rapidly in population than others, the division has become so entirely out of date that during the first half of 1892 the bills ranged from 2,685 to 7,076 during the different months. May and November have the smallest and June and December the largest number.

It will be a matter of considerable difficulty and expense to re-adjust the districts so that the work will be more nearly equalized. Its necessity can not be questioned. It fortunately happens that new books will not have to be made in lieu of the thirty-eight costly plat books that show the location of the hydrants and the street-connections. It is the general district plats only that will have to be replaced.

The surveyors are required to inspect each house in their respective districts before making out new bills. Each of the six districts is subdivided into six routes. The surveyors are transferred each month to a new district, and are surveyors of routes and not of districts. Each



man takes charge of a route of the same number in every month throughout the year. They are also charged with the duty of inquiring into the illegal use of water in their districts.

The number of survey bills is nearly 58,000.

Receipts from survey bills in 1890 .....	395,181 41
Receipts from survey bills in 1891 .....	462,253 16
Increase .....	\$67,071 75=17 per cent.

#### METER BILLS.

The income received for water measured by meters is about one fourth of the entire rent paid.

Receipts by meter in 1890 .....	151,314 45
Receipts by meter in 1891 .....	180,346 05
Increase .....	\$29,031 60=20 per cent.

The minimum annual charge for a meter is twenty-five dollars. In the case of one fifth of the bills the measurement does not exceed this amount, and the monthly collection of the sum of \$2.08 in each instance seems to create unnecessary work. The bills of this class could be reduced from 4,100 to 700 by collecting them as the survey bills are collected — semi-annually in advance — while the monthly inspection would, as it does now, reveal any consumption in excess of 1,850 cubic feet per month, the amount upon which the charge of twenty-five dollars is based. It would relieve the consumers of the troublesome duty of going twelve times a year to pay so insignificant a sum, but the change might, as insisted upon by the management, introduce an element of disorder into the service. A reduction of the limit of twenty-five dollars or its entire abolition are measures suggested by the consumers.

The perfect meter is a machine yet to be invented, and it is claimed that unusual difficulties are encountered in the use of small meters, especially in Cincinnati, where deposits of mud interfere with the working of large meters. As the estimate of the water wasted and not used by the consumer is placed at sixty per cent, an effort should certainly be made to extend the meter service.

The meters are furnished by the department, but paid for by the consumer, who is also required to pay the cost of repairs. A small

fractional amount in excess of cost is charged to guard against the possibility of loss. One result of this contract is that the consumer is tardy in reporting that his meter is out of order. It is clear that a meter acts as a check upon the consumer, and is an effective restraint upon wasteful consumption. The fact that a bill for \$28 was presented to a consumer for water lost by a leak, instead of his usual monthly bill of \$2.08, shows, however, that it does not always serve this purpose.

The advisability of providing meters at the cost of the department, in the manner that meters are furnished by gas companies, is an interesting subject of inquiry. At the present time a consumer, if he thinks it to his interest, puts in a meter at his own cost, and is permitted to select one from several forms of meter, made by four separate concerns. He is restrained, by the fact that he owns the apparatus and has been given a wide range of choice in selecting it, from making the complaints he would certainly make if the department owned the meter.

The change might intensify the already strained relations between the department and the consumers, but its merits as a business proposition can not easily be set aside. In case of its adoption, some plan of adjusting the equities that would then exist in favor of the 1,600 consumers who have already provided themselves with meters at their own cost would have to be devised. If the cost of these machines were allowed as a credit on the meter-rents of any one year, it would seriously embarrass the department. Its allowance in two or three annual installments would be no insignificant matter.

#### ELEVATOR BILLS.

The sum paid for this service is about one twelfth of the net receipts for rents of all kinds.

Receipts from elevators in 1890.....	50,158 14
Receipts from elevators in 1891.....	60,222 63
Increase .....	\$10,064 49=20 per cent.

Experience has shown that a meter can not be used to measure the water consumed in running an elevator. The impact that follows the sudden stoppage of the flow breaks the apparatus and prevents its use. The measurement is made by an indicator that registers the number of feet traveled by the piston as it moves through the

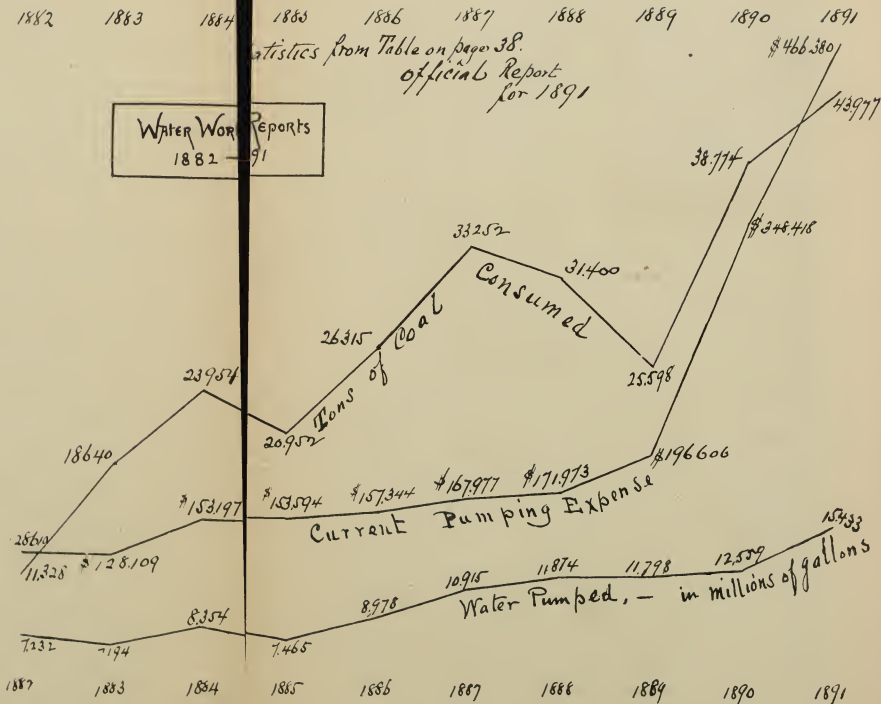


cylinder. The cog-wheels on the indicator are set in gear with a larger wheel that revolves by contact as it passes along a guiding-track. A direct loss in registering is caused, in many cases, by the grease used in the cylinder, which becomes diverted from its proper use, and either through carelessness or design is allowed to encumber the track. The grease weakens the friction upon which the revolution of the wheel depends; consequently the wheel slips in certain parts of the stroke without revolving on its axis. It happens, therefore, that while the piston is regularly pushed forward and water consumed, no registry is made on the indicator. Badly-packed piston-heads waste water in great quantity. Whatever amount happens to pass through the cylinder in this way remains unregistered on the indicator. The stopping off of water in the case of waste by owners of elevators is considered so severe a measure that the inspectors hesitate to enforce the penalty, and the loss continues at a rate that is no inconsiderable matter.

While engaged in this examination I have had ample opportunities of noticing the work performed by the force engaged in assessing and collecting the rents. The complaints are many—the concessions few. I have seen nothing that has given me the idea that this branch of the service is carelessly administered. It is not to be supposed, however, that the sum of \$2,300, considered by the average citizen as a species of tax, can be collected daily in small sums without considerable friction. The department is the one with which the people are the most frequently brought in contact. The altercations in regard to bills are frequent, and their effect is to render the officers uncunctious and unyielding in regard to every thing that concerns the consumers.

The bills of all kinds for water-rent exceed 85,000 each year. The cases in which the sum charged is not collected are few in number and small in amount. In 1891 the uncollected survey bills amounted to \$895.81. As the supply of water was, in each instance, cut off within thirty or sixty days, the actual loss was not one sixth of that sum. The uncollected meter bills during the same period were only \$30.86, and the elevator bills \$48.25. It follows that the entire amount lost by reason of uncollected bills during the year did not exceed \$250, or one twenty-ninth of one per cent, in a total gross income from rents of \$733,905.35, a fact that illustrates the extremely sharp way in which the administrators of the department look after the income.





It has, of course, been impracticable to make any examination of the vast mass of bills against consumers made out by the department. I have, however, examined a few bills of each class, and have found them correctly made out and duly entered in the Consumption Book.

### EXPENDITURES.

The income of the Waterworks is not, however, the feature of the management that demands special investigation. One does not have to go beyond the reports made by the department during the last ten years to comprehend the extraordinary increase in its expenses. The facts are patent; they appear on every page; yet it may be assumed that the compilers of the reports have given the most favorable view of the situation that can be presented. In the table on page 38, in the report of 1891, the following statement is made:

Pumping expenses, 1892.....	128,610 36
Pumping expenses, 1891.....	466,380 42

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Increase ..... \$337,770 06=264 per cent.

If a proportionate increase could be discovered in the service performed, the greater expense would be justified. That it is not is amply proven by the figures in the table on page 15.

Water consumed in 1882.....	7,127,369,260 gallons.
Water consumed in 1891.....	15,373,583,266     “

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Increase ..... 8,246,214,006=115 per cent.

In other words, unlike any well-conducted private business, no economy has been found in the greater volume. The greater number of gallons has been pumped at an increased cost per gallon.

An examination of these figures will show that the cost of pumping 1,000 gallons was one cent and eighty-one hundredths (1.81) in 1882, and three cents and three hundredths (3.03) in 1891. The actual cost, in all probability, augmented in a still greater degree, as the increase in the consumption of water during the ten years did not actually exceed one hundred per cent. The reasons for this belief are given in the remarks made in regard to the official report of 1891.

## THE OFFICIAL REPORT OF 1891.

The report of the Waterworks Department for 1891 contains errors and discrepancies that are seen on very slight examination of its details.

Page 49, cost of coal consumed in pumping.....	\$131,775 00
Page 38, number of tons.....	43,977
Page 38, cost of coal, per ton ...	\$2 80
Page 38, daily average consumption in tons .....	61.84

If 43.997 tons cost \$131,775, the average price per ton was \$2.99. If 43,997 tons were consumed in 365 days, the daily average consumption was 120.48. The cost of the coal during the entire year is, however, approximately correct. The actual cost was \$131,885.14, as will appear by reference to the detailed statement of the vouchers for coal delivered and paid for from January 1, 1891, to October 1, 1892, attached hereto and marked "Exhibit A." It will be seen that the aggregate number of tons is greatly at variance with the statement in the official report.

Number of tons, as per vouchers.....	53,186
Number of tons, as stated in report.....	43,997
Difference .....	9,189

The explanation of this erroneous statement adequately exposes the extremely fallacious method that has been followed in making out the report. It need not, however, be assumed that any new formula was chosen, for the Superintendent merely followed the example set by his predecessors in office. All the reports for many years have been equally delusive and contain the same untrustworthy statistics.

To return to the explanation given in regard to the report. In one of the columns of the table on page 38 is the following statement of coal consumed:

Front Street.....	84,970,200 pounds.
Hunt Street .....	8,064,501 "
Eighth Street.....	1,076,927 "
	<hr/>
	94,111,628 "

These figures represent aggregates arrived at from a register of the wheelbarrow-loads of coal cast daily under the furnaces, a most magnificent formula of guess-work, when it is remembered that until

recently the workmen guessed at the weight of each load. When this amount of 94,111,628 pounds is reduced to tons of 2,000 pounds each, the aggregate is 47,055 tons, a number greatly in excess of the 43,997 tons stated in the report: but, nevertheless, it explains the erroneous statement of the cost of \$2.80 per ton given (131,775 divided by 47,055 equals 280). No explanation is, however, given of the blunder in regard to the average daily consumption—61.84 tons, as stated on page 38 of the report—which, on the basis of the erroneous number of tons stated (43,997), reaches double that amount, viz., 120.48 tons. The actual daily consumption was, however, 145.71 tons daily. On page 11 of the report the consumption per inhabitant is stated at 199.67 gallons per diem. This, however, is based on the consumption of the maximum day of the year—September 11th. The average, according to the average consumption claimed in the report, is 138.09 gallons per day for each inhabitant—a little more than two thirds of the amount stated.

On page 10 the interest paid in 1891 is stated at \$119,913.02, while on page 53 the amount is given \$119,943.35. The discrepancy consists of \$30.33, paid as interest on \$14,000 borrowed from the Market National Bank. The remainder is wholly payments of interest on bonds.

The statistics in regard to the water pumped can not be adopted as an accurate statement of the service performed. They are based on the record made by the indicators on the steam cylinders, a method of ascertaining the number of gallons pumped that is entirely delusive, notwithstanding the fact that it is in use in every pumping station in the country. The indicators undoubtedly give an exact record of the strokes made by each engine during the year, but what is needed in addition is an apparatus to measure the deficiency arising from the imperfect filling of the pumps. An engine may be started and fail to take water for an hour, yet the record of the indicator goes on the same as if work was actually being done.

The Worthington engines have no fly-wheel and displace water to the extent of the stroke made, or give unmistakable signs of the interference of air. The full stroke of these pumps is fifty inches; but I found that one plunger was, by actual measurement, regularly descending forty-eight inches only, and the other but forty-four inches. Here is a deficiency of four per cent and twelve per cent in the pumps which have the slowest speed in the house—88 and 96 feet per minute—against 160 feet in the Wetherill, 224 feet



in the Scowden, and 256 feet in the Harkness and Powell engines. What must the shortage be in the more rapidly-moving pumps? The Worthington pumps are new; what must it be in the case of the old, worn pumps that give no sign as the fly-wheel carries the plunger to the full length of the stroke, whether the pumps are filled or not?

Even after a sufficient vacuum is attained, while the pumps are seemingly forcing water with clock-like regularity, sudden variations occur in the flow of the water passing into the reservoirs. No more certain indication of the uncertainty that attaches itself to these figures could be given.

The information that I have gathered upon the subject leads me to believe that the actual number of gallons pumped each day does not, at a liberal estimate, exceed eighty per cent of the amount claimed in the reports. In other words, the consumption of water in 1891 was about 33,500,000 gallons a day, instead of 42,119,406 gallons, as stated on page 13 of the report; and 109 gallons per inhabitant per day represents the per capita, instead of 199.67 gallons, as set forth on the same page of this most misleading document.

At the present time Mr. Tharp is preparing to measure the water flowing into the Eden-Park reservoir by means of a weir. It will be in service by the beginning of the new year. The plans are on file in the draughting office. It is claimed that the device will fulfill every scientific requirement. The form selected is rectangular; the section of the water behind the crest is comparatively small, and the discharge is at right angles to the direction of the flow. When it is put in use a more accurate measurement of the water pumped may be expected. Accurate measurement by means of a weir is, however, an extremely delicate matter. The head, or verticle distance to a point where the water is perfectly still, has to be ascertained with the greatest care—the deviation of the weir from an exact level must be known, as well as the velocity with which the water approaches, in order to compute the discharge. It is possible to measure the head within the one one-thousandth of a foot. If this degree of accuracy is not attained, the fraction of error augments and renders the computation worthless.

In the report of 1891, page 15, the increase in the consumption of water is given as follows:

1882.....	7,127,369,260 gallons.
1891.....	15,373,583,266 “
Difference .....	8,246,214,006 “



This increase is equal to 115 per cent, but there are statistics in regard to other matters in the report that cast a doubt on the accuracy of the statement.

In the table on page 15 the following details are found:

Number of service branches in 1882 .....	24,858
Number of service branches in 1891 .....	<u>36,754</u>
Increase.....	11,896=48 per cent.
Area of service branches in sq. inches in 1882.	12,349
Area of service branches in sq. inches in 1891.	<u>21,239</u>
Increase.....	8,890=72 per cent.

An allowance should be made for an increased ease of flow in addition to the mere proportionate increase in the area of the branches; but the enlargement of the average branch from .498 of a square inch in 1882 to .577 of a square inch in 1891 represents an increase of 34 per cent only, being the difference between the squares of their diameters. This fails to account for the difference between 72 and 115 per cent, which amounts to 60 per cent.

Another fact must be kept in mind: it is true that the statistics in regard to the consumption of water in 1882 are, without doubt, as delusive as those of 1891; but it must be remembered that in the interval between these years the old machinery, constituting the greater portion of the plant, naturally became reduced in efficiency in spite of all the care taken to preserve it and keep it in order. A careful examination of the question leads me to believe that the increase during the ten years named was under rather than over one hundred per cent, or an average annual increase over each preceding year of about nine per cent.

To sum the matter up, it is impossible to accept any of the official statistics in regard to the water-delivery, or the consumption, which is the same thing, less the loss by evaporation and leakage from the reservoirs. Each year, for many years, the exaggerated statements of previous administrations have been made the basis of the report and the measure of comparison. In order to preserve any reputation for good management, each Superintendent has been forced to make still greater exaggerations in regard to the service performed. It is time to halt and begin anew. Mr. Tharp has the opportunity. Measurement by a weir, if carefully attended to, will supply the needed means of correction.

## COAL CONTRACTS.

A contract for coal for one year, ending May 1, 1891, was made with W. H. Brown & Sons at the rate of \$1.87 per ton delivered at Front-street Works and \$2.35 at Hunt-street Works. The specifications upon which the contract was awarded are signed by Willis P. Tharp, Superintendent and Engineer; the bid of W. H. Brown & Sons is signed on their behalf by J. P. Bauer, Agent. A letter of the Superintendent, of date May 1, 1890, reported to the Board of Public Improvements that W. H. Brown & Sons were the lowest and best bidders, and recommended that a contract be entered into with them for the coal required at the Front- and Hunt-street stations. The form of contract printed on the specifications was filled out for signature, but was never signed either on behalf of the Board or of W. H. Brown & Sons; the refusal of the latter to sign having been made on the claim that no contract could be legally entered into unless the Auditor was able to certify that all the money appropriated under its terms was in the city treasury at the time.

Messrs. W. H. Brown & Sons, as it appears from the vouchers, delivered coal at the two stations named, at the prices specified in their bid, until January following, when they sought to rid themselves of its obligations under the plea that they had delivered all they were required to deliver in accordance with the specifications—viz.: 30,000 tons, more or less, at Front-street Works, and 3,000 tons, more or less, at Hunt-street Works. A supposed reversal of the conditions shows the exact value of the plea of Messrs. W. H. Brown & Sons. If the city had found 25,000 tons to be the full quantity required, could Messrs. W. H. Brown & Sons have compelled the department to accept 5,000 additional tons under the contract?

The Board of City Affairs referred the matter to their legal adviser and received the following reply:

OFFICE OF THE CITY SOLICITOR,  
CINCINNATI, January 26, 1891. }

HONORABLE BOARD OF CITY AFFAIRS:

*Gentlemen,*—I am of opinion that W. H. Brown & Sons should be required to furnish coal to the Water Department for the term of one year. The specifications indicate that the supply is to be for one year, and that the amounts stated are only estimated quantities.

Respectfully submitted,

THEODORE HORSTMAN,  
*City Solicitor.*

Meanwhile the Board of Public Improvements came back into power, and treated the contract as a nullity by advertising for proposals to be made by March 14, 1891, for coal for one year. The Superintendent, by letter of March 17, 1891, reported that the Consolidated Coal and Mining Company were the lowest and best bidders, and recommended that a contract be made with them at \$2.43 per ton at Front Street and \$2.65 at Hunt Street. He further says: "I would call attention to the fact that at present we have no contract, and have been, for the last thirty days, buying coal from W. H. Brown & Sons at a price to be determined when the contract is let for next year's supply, meaning such contracts as may be made on the present proposals."

On the same day, March 17, 1891, a suit was brought in the Common Pleas Court—No. 89,569, the State of Ohio on the relation of the Winifrede Coal Company against Louis Reemelin *et al.*, constituting the Board of Improvements. The petition recites a bid for the delivery of coal at the Front-street Works at \$2.37, and \$2.50 at the Hunt-street Works, and asks for a mandamus compelling the Board to award the contract to the relators.

On the following day, March 18, 1891, another suit was brought in same court—No. 89,563—by Clarence H. Jones, a tax-payer, against Edwin Stevens, Comptroller, and Henry Ziegler, Treasurer of the city of Cincinnati. The petition states the terms of the bid of the Winifrede Coal Company; the refusal of the Board to contract with said company; and further refers to a contract on behalf of the Waterworks Department with W. H. Brown & Sons, of February 15, 1891, and asks for a restraining order against the defendants, forbidding them to pay any money to W. H. Brown & Sons on account of this new contract. Nevertheless, the Board of Public Improvements, on March 27, 1891, approved a voucher, No. 4,645, duly signed by the Superintendent, for the payment of fifty six cents per ton in excess of \$1.87, the contract price of May 1, 1890, already paid on all bills (vouchers Nos. 4,442, 4,451, 4,452, 4,474, 4,475, 4 552) for coal delivered after February 1, 1891, at the Front-street Works, amounting to  $(4,359\frac{1400}{2000}$  tons at .56) \$2,441.43, and thirty cents per ton in excess of contract price of May 1, 1890, at \$2.35 for coal (vouchers Nos. 4,550, 4,553, 4,608) delivered at Hunt-street Works, amounting to  $(203\frac{1278}{2000}$  tons at .30) \$61.09; the total excess payment being \$2,502.52. This large sum was ordered to be paid in violation of the terms of a contract that did not expire until the 1st of May following, and in defiance of the opinion of the City Solicitor to the contrary.

Notwithstanding the injunction issued by the court, the Comptroller issued his warrant, and the money was paid by the Treasurer the same day, March 27, 1891, nine days after the service of the restraining order. The plea of inadvertence and mistake was offered by the defendants as an apology for their conduct, and a small fine of twenty-five dollars was imposed by the court on each defendant. The first suit brought, that of the Winifrede Coal Company, was finally dismissed, October 8, 1891, at plaintiff's costs, Judge Maxwell holding that the fact that their bid included matters not contained in the specifications issued by the Waterworks Department—viz., an exemption from their obligation to deliver coal in case of miners' strikes, and a stipulation that the coal should be taken at elevator weights—which took away from them all right to demand an award of the contract.

On March 28, 1891, The Consolidated Coal and Mining Company began to deliver coal at the Front- and Hunt-street Works at the rates named in their bid, and continued to make delivery until June 13, 1891, when the Superintendent refused to receive their coal on account of its not being equal to the requirements of the contract. (See copy of letter of Willis P. Tharp, June 1, 1891, attached hereto, marked "Exhibit B.")

Their deliveries ceased until July 20, 1891. During this time, however, the two pumping stations named were supplied by W. H. Brown & Sons and Sol. P. Kineon, the latter being one of the sureties named by The Consolidated Coal and Mining Company in their bid made, under the proposals of March 17th. The prices—viz., \$3.00 per ton from June 15th to June 27th, and \$2.90 after that time—were, it should be noted, in excess of the prices stipulated in the contract of The Consolidated Coal and Mining Company. In other words, instead of arranging to bring suit against the surety, the board proceeded to buy coal from him at an advanced price.

Under this arrangement Brown delivered  $484\frac{666}{2000}$  tons at Front Street; Kineon  $484\frac{1720}{2000}$  at Front Street and  $58\frac{718}{2000}$  at Hunt Street; all at \$3.00. Kineon delivered  $3,232\frac{1485}{2000}$  tons at Front Street and  $340\frac{165}{2000}$  at Hunt Street, both at \$2.90. The excess payments thus made were as follows:

Brown.....	484.666	tons at 57 cents.....	276 06
Kineon.....	484.1720	" 57 " .....	276 37
Kineon.....	3,232.1485	" 47 " .....	1,519 12
Kineon.....	58.718	" 35 " .....	19 55
Kineon.....	340.165	" 30 " .....	10 22
<hr/>			<hr/>
$4,600\frac{754}{2000}$ tons.			\$2,101 32



This sum of \$2,101.32 was paid by the city by reason of the failure of the contracting company to furnish coal in the required quality.

The contract of The Consolidated Coal and Mining Company on file bears no date; the bond is also without date; no date of contract is named in the bond, and the sole indications are the affidavit of Sol. P. Kineon and W. Austin Goodman, the sureties, that they were severally worth ten thousand dollars, dated July 10, 1891. The Auditor approved the sureties July 11, 1891. Alex. McDonald was first offered as a surety on the bond, but W. Austin Goodman was substituted when the bond was signed.

The irregularities in the coal contracts were not, however, confined to the year 1891, but extend into 1892. A comparison of the price of nut and slack coal in vouchers Nos. 5,666 and 5,852 with Nos. 5,714, 5,717, 5,724, 5,746, 5,786, 5,851*a*, 5,851*b*, 5,860, 5,879, 5,921, and 5,923 will make this statement obvious. In the first two bills the price is \$1.75 per ton, while in the eleven vouchers that follow it is \$1.93. In January, 1892, The Consolidated Coal and Mining Company was still engaged in carrying out its contract of March, 1891, for one year, which related to second-pool Youghiogheny only, and did not cover nut and slack coal. The city was therefore under no legal obligations to buy that particular kind of coal from the company.

The first bill for nut and slack coal—No. 5,666—is from W. H. Brown & Sons, and specifies the delivery of 271 tons 290 pounds at the Front-street Pumping Works January 25, 1892, at \$1.75 per ton. This bill is sufficient evidence that the parties in charge considered they were free to buy nut and slack coal from any one who could furnish it. The voucher is followed by Nos. 5,714, 5,717, 5,724, 5,746, and 5,786, which show that 1,183 tons 85 pounds nut and slack coal were bought from The Consolidated Coal and Mining Company at \$1.93 per ton. February 9, 1892, a second bill of W. H. Brown & Sons—No. 5,852—is found, by which it appears that 124 tons 1,210 pounds were bought at \$1.75 per ton. This voucher is followed by six bills of The Consolidated Coal and Mining Company for 1,063 tons 710 pounds at \$1.93. These bills bring the history of the coal transactions down to March 28, 1892, when W. H. Brown & Sons began to deliver nut and slack under their contract for the ensuing twelve months at \$1.63 a ton.

An examination of this series of vouchers will show that 2,246 tons 795 pounds of nut and slack coal were delivered and paid for in

January, February, and March, 1892, at this higher price—viz., \$1.93 a ton. The excess payment on 2,246 tons 795 pounds, at 18 cents a ton, amounts to \$404.35. It is clear that The Consolidated Coal and Mining Company had no exclusive right to deliver nut and slack coal at \$1.93 a ton, or at any other price. The readiness of W. H. Brown & Sons to take a yearly contract at \$1.63, or thirty cents a ton less than the price paid to The Consolidated Coal and Mining Company, is excellent evidence that \$1.75, the price paid for the two lots furnished by the first named parties in January and February, would, in the absence of a regular yearly contract, have been an ample price for the 2,246 tons 795 pounds delivered.

I would also like to call attention to the fact that three of these vouchers—viz.: No. 5,714 for \$585.94, No. 5,717 for \$636.01, and No. 5,724 for \$619.64—are in excess of \$500, and clearly bring the members of the Board of Administration and the Superintendent of the Waterworks under the provisions of "An act to regulate the award of contracts and for other purposes in cities of the first grade of the first class," passed March 21, 1887. The violation of the law is complete, and there was no attempt to evade its provisions, as in the case of the vouchers for lead, that will be hereafter set forth.

In the vouchers for coal furnished by W. H. Brown & Sons and Sol. P. Kineon in June and July, 1891, especial care was taken that no bill should exceed \$500 in amount. In fact, I found the chief difficulty in checking off the records of the coal delivered at that time was due to the remarkable fashion in which the figures that represented the weights of certain loads of coal had been deducted from the receipts of one day and added to those of another, in order to bring the bills within the required limit. The tangle at first seemed inextricable, but with the explanations of Mr. Talbot the difficulties were at last overcome, and I finally became satisfied that his weights corresponded with those rendered in the bills.

Copies of eight letters addressed by Mr. Tharp to the Pittsburgh Coal Company, between March 22d and June 6th, 1892, are hereto attached, marked "Exhibit C." This correspondence sufficiently illustrates the difficulties encountered by the officers acting on behalf of the city, and the necessity of persistent effort in compelling the contractors to furnish written evidence of their agreements. The contract was once returned to the department unsigned, and it was not until after the seventh letter and an interval of two months and a half that it was received by the Superintendent with the signatures

of the contractors. However, it may be noted that the contract in question is the only one on file in which all the details have been strictly attended to. For evidence of the careless manner in which the business has been conducted, see the copies of the contracts set forth in Exhibits "D," "E," and "F," attached hereto.

The conditions of supply at the Front-street Works are imperative. Whether contracts have been made or not, whether contractors may be unwilling to deliver coal in the required quantity or of the quality stipulated in their agreements, the exigencies of the situation must be met. The case becomes one in which "necessity knows no law," and immediate action alone can avoid the consequences of shutting down the works.

A review of the entire series of coal contracts does not suggest pleasing matters of reflection. The obstinate refusal of the successful bidders to sign the agreements they had agreed to make, the omissions in the contracts when signed, the loop-holes left for the sureties on the bond, all seem to indicate an unpraiseworthy desire to place the city in a position in which it would be required to take the coal, while the contractors would be relieved from any binding obligation to deliver it.

Details of Coal Bills in 1891 (twelve months).

	Tons.	Cost.
Front-street Works .....	48,355.47	118,672 97
Hunt-street Works .....	4,181.1760	11,030 81
Eighth-street Works .....	649.555	1,589 04
	53,186 $\frac{862}{2000}$	131,292 82
Office .....	56.1800	171 00
Machine-shops .....	37,530	143 06
Hydrant service .....	4	11 00
Twelfth-street Yard .....	42	124 50
Charles-street Yard .....	11	34 00
Price-Hill tank .....	6.550	18 75
Mt. Auburn tank .....	4.775	14 25
Eden-Park reservoir .....	16.725	59 26
Stables .....	6	16 50
	53,370 $\frac{742}{2000}$	\$131,885 14



## Details of Coal Bills in 1892 (nine months, to October 1st).

	Tons.	Cost.
Front-street Works.....	32,089.120	66,106 68
Hunt-street Works.....	3,668.353	8,922 10
Eighth-street Works.....	465.670	1,197 25
	36,222 <sup>1143</sup> / <sub>2000</sub>	76,226 03
Office .....	28.1800	81 00
Machine-shop .....	17.600	63 20
Twelfth-street Yard.....	44.450	126 61
Price-Hill tank .....	1	3 00
Mt. Auburn tank .....	5.500	18 38
Eden-Park reservoir .....	2	5 42
Third-street reservoir.....	2	6 00
Mt. Hope.....	4.400	12 05
	36,327 <sup>893</sup> / <sub>2000</sub>	\$76,541 69

## CONSUMPTION OF FUEL AT FRONT-STREET WORKS.

An encouraging feature is found in the marked decrease in the quantity and also the cost of the coal used at the Front-street Pumping Works during the present year. A comparative statement for the nine months ending September 30th is derived from an analysis of the bills set forth in "Exhibit A."

1891 .....	37,465 tons	427 pounds.....	92,208 91
1892 .....	32,089 "	120 " .....	66,106 68
Decrease.....	5,376 "	307 " .....	\$26,102 23

The reduction in the amount of coal consumed is 14.30 per cent and the decrease in its cost 28.30 per cent. Should the same percentages continue until the close of the year, the saving will be 6,933 tons 533 pounds of coal, and the cost will be reduced in the sum of \$33,592.55. The decrease in the number of tons of coal consumed is the important matter of consideration; the cost of the coal for the year is an accidental fact, dependent on the price at which the department is able to make the contract.

In carrying on this inquiry the question follows whether the diminished consumption of coal is accompanied by a falling off in the service performed. Has the amount of water pumped in 1892 been less than in 1891? If the records of the Front-street Pumping Station be taken as true, there has been a marked decrease in the

water delivery during the nine months ending September 30, 1892. The record is as follows:

	1891.		1892.	
	Revolutions.	Gallons.	Revolutions.	Gallons.
Engine No. 4.....	5,054,001	1,010 800,200	5,323,403	1,064,680,600
“ “ 5.....	5,290,002	1,084,450,410	5,070,366	1,039,425,030
“ “ 6.....	230,078	138,046,800	.....	.....
“ “ 7.....	3,396,288	1,154,737,920	3,879,753	1,319,126,020
“ “ 8.....	4,144,581	1,409,157,540	4,351,466	1,479,498,440
“ “ 9.....	1,960,522	715,590,530	.....	.....
“ “ 10.....	132,960	48,530,400	4,420,313	1,613,414,245
“ “ 11.....	1,171,172	822,748,340	.....	.....
“ “ 12.....	1,344,432	944,463,480	3,631,320	2,551,002,300
Auxiliary .....	.....	4,404,090,008	.....	1,345,329,592
	22,724,036	11,732,615,628	26,676,621	10,412,476,227
		10,412,476,227		
Decrease.....	.....	1,320,139,401	=11.25 per cent.	

This comparative falling off in the service performed appears in the record in despite of the fact that there was a great increase in the number of revolutions made by the nine engines in the pumping room, and also in the number of gallons claimed to be pumped by them.

Engines Nos. 4 to 12 inclusive:

	Revolutions.	Gallons.
1891 .....	22,724,036	7,328,525,620
1892 .....	26,676,621	9,067,146,635
Increase .....	3,952,585=17.39 per cent.	1,738,621,015=23.72 per cent.

The decrease is in the returns of the auxiliary engines.

	Hours.	Gallons.	Gallons per hour.
Six engines 1891 .....	34,012	4,004,090,008	129,486
Five engines 1892 .....	9,742	1,345,319,592	138,095

It may be noted that Auxiliary No. 3, an engine of much less capacity than the other five machines in the plant, was not in service during the present year. The absence of its return from the record

may be taken as an explanation of the increase in the number of gallons pumped per hour in 1892.

The figures of the official report, as has been already seen, are not to be accepted when they favor the management; but in the present case it does not require a very long investigation to see that when they are against it they are equally unreliable. It happens that there is an abundance of collateral evidence as to the amount of water pumped in 1892 and 1891. The record of the depth of water in the Eden-Park reservoir, kept in the Seventh-street office, from reports made hourly by telephone, is conclusive. It requires but a few minutes inspection to be convinced that the water has been maintained at a greater height during the present year than during the season of 1891. It has been kept throughout the entire year very near the level at which it flows over the wall disconnecting its two great divisions, while in 1891 it was frequently far from being full. Increased depth of water in the reservoir, by reason of the augmented pressure, necessarily caused an increase in consumption. Greater height, therefore, indicates that a relatively still larger quantity was delivered.

The "Application Book" shows that 992 new service branches were put in during the nine months ending September 30, 1892. From all these facts the conclusion must be drawn that an increased amount of water was consumed in 1892, that approximated to the average annual increase which, as already has been said, probably amounts to nine per cent.

The water has undoubtedly been pumped; how are we to account for a fact so contrary to the official statistics?

The increased delivery may, in general terms, be attributed to the fact that the engines within the house were in better order in 1892 than in 1891. This undoubtedly was the case. As their revolutions were increased, the explanation suffices. There is however, another way of explaining the matter, or at least of giving a reason for the predominance of the record of 1891 in defiance of the fact. The auxiliary engines were, in the nine months in 1891, in commission during the whole period, and during three months only in 1892. If there is a serious blunder in the statistics as to the water pumped by these engines, it is clear that 1892 would suffer in the comparison, as there would be a greater share of exaggeration injected into the record of 1891. The amount of water assumed to be pumped by the auxiliary engines can not be correct, for otherwise it would not embarrass the

statistics, and come back to the discomfiture of the official record, as it does in the present instance. To admit the claims made on behalf of these engines would be to suppose their average piston speed (24 inch stroke, forty to forty-five revolutions) to be 170 feet per minute, and a full stroke at each revolution. A large margin of deficiency should certainly be allowed.

The prime cause of this extraordinary reduction in the consumption of fuel is the feed-water heater, first put in operation in the beginning of January of the present year. The heaters call for no additional consumption of fuel; the exhaust steam is utilized to raise the temperature of the water fed to the boilers. Why an apparatus of this kind was not introduced into the works long before does not appear. Mr. Tharp modestly disclaims any great credit for introducing so obvious a means of reducing the enormous coal bills of the department, but it is certain that the omission to have it done at an earlier date reflects no credit on the administration of his predecessors.

The good effects of the device can be ascertained by means of a calculation based on the temperature of the feed-water. Eleven hundred and forty-six units of heat (Fahrenheit) are required to raise water from thirty-two degrees to the boiling-point. The mean average temperature throughout the year of the water taken from the Ohio River at the Waterworks is sixty-two degrees, or thirty degrees above the freezing-point. Consequently without the use of a heater eleven hundred and sixteen units of heat ( $1146 - 30 = 1116$ ) are required to raise steam at the pumping house. With both heaters in use, as I am informed by Mr. Meredith, the water is delivered in the boilers at one hundred and ninety-seven degrees, or at a temperature one hundred and thirty-five degrees ( $197 - 62 = 135$ ) higher than its average temperature in the river. The conclusion must be that as 135 is 12.09 per cent of 1,116, therefore this percentage expresses the saving due to the use of the heaters. This, however, is the *maximum* economy, as a temperature of one hundred and ninety-seven degrees in the feed-water requires that both heaters should be used. When one only is used, the temperature is, as I am able to state from my own observation, one hundred and seventy degrees. It follows in that case that the saving is less ( $170 - 62 = 108$ ). As 108 is but 9.67 per cent of 1,116, this lesser percentage is the *minimum* saved by the device. On account of the repairs not infrequently required by one or the other of the two engines that supply the exhaust steam used in the heaters, the actual saving, therefore, lies between 9.67



per cent and 12.09 per cent, being very much nearer the latter than the former figure.

In either case a difference exists between this amount and the 14.30 per cent of economy in the number of tons of coal consumed; that has been demonstrated by the bills. In a general way, the cause of this excess may be largely attributed to the use of the Stirling boilers, also introduced into the works about the first of January, 1892. The battery consists of five boilers, each of a rated capacity of 240 horse-power. Their low cost may be offset by the fact that they are comparatively short-lived, but their capacity to raise steam at a greatly reduced cost does not admit of doubt. Their chief merit is that nut and slack coal can be burned in the furnaces at a cost of \$1.63 per ton, in the place of lump coal costing \$2.21 per ton. I have been unable to procure any data as to whether these boilers increase the number of tons of coal consumed and make the saving by reducing its cost, or whether the amount of coal used is lessened as well as the cost. If the first assumed condition holds good, Mr. Tharp can be credited with a certain portion of the saving in the *cost* that can in that case be justly added to the exact statement of the 14.30 per cent reduction in the *number of tons*.

If any additional reason is required for the reduction in the coal bills at the Front-street Works, it may be found in the fact that the auxiliary plant boilers outside the pumping house were used in three months only out of the nine months in 1892. It may be remarked that these boilers call for an extravagant use of coal, justified only by the exceptional conditions under which they were first introduced, and the necessities of the works that have kept them in commission.

#### CONSUMPTION OF FUEL AT HUNT-STREET WORKS.

The comparative statement of the coal consumed at the Hunt-street Pumping Station for the nine months ending September 30th is as follows:

1891.....	3,297 tons	1,685 pounds.....	8,688	10
1892.....	3,560	" 1,718	"	8,637 71
Increase.....	263	" 33	"	Decrease..... \$50 39

The increase in the coal consumed is 8.58 per cent; but, owing to the more favorable contracts for the present year, the amount paid for it has slightly decreased. An increase in the duty performed fully accounts for the increase in the consumption of coal. Extra service

was performed in response to the demands made on the station during the summer of 1892. The records kept at the pumping house clearly show the difficulty of keeping up the supply in the months of June, July, August, and September. Unlike the records of the Front-street Pumping House, the statistics kept at the Hunt-street Works can be considered as entirely accurate returns of the service performed. This arises from the wholly different conditions under which the work is done. At Hunt Street the water is not lifted, but is received by direct pressure from the mains leading from the Eden-Park reservoir. As the supply is received under an average pressure of twenty pounds to the inch, in addition to atmospheric pressure, the pumps are completely filled at every stroke.

	1891.		1892.
January .....	104,855,640	gallons.....	102,507,776 gallons.
February.....	92,244,108	" .....	97,533,752 "
March.....	100,697,272	" .....	103,872,784 "
April.....	105,065,628	" .....	111,621,468 "
May.....	129,469,724	" .....	127,438,884 "
June.....	128,005,024	" .....	146,180,352 "
July.....	143,562,384	" .....	172,708,796 "
August.....	137,579,520	" .....	176,951,600 "
September.....	126,740,480	" .....	153,737,132 "
	<u>1,068,219,780</u>	" .....	<u>1,192,552,544</u> "

These figures show an increase of 11.63 per cent in the amount of water consumed. As this percentage exceeds the increase in the consumption of coal (8.58 per cent), the works have been more economically conducted in 1892 than in 1891.

The engines at Hunt Street made more revolutions to the minute during the summer of 1892 than in the same period in 1891, so that the conditions were more burdensome, as will be seen by the following statement, taken from the books of the pumping house :

	1891		1892	
	Hours.	Revolutions.	Hours.	Revolutions.
June .....	625.55	560,004	620.05	571,017
July.....	651.20	560,764	671.20	648,632
August.....	646.50	537,420	686.20	676,032
September .....	618.25	485,080	633.05	601,529
	<u>2,542.30</u>	<u>2,093,268</u>	<u>2,604.50</u>	<u>2,497,210</u>

By a comparison of the columns of this table it will be seen that during the months named the speed was increased in 1892 to 15.97 revolutions per minute, against 13.65 revolutions per minute during the same months in 1891. The relative economy of fuel was consequently attained, notwithstanding the greater steam pressure required to run the engines at increased speed.

It may be information in the nature of a surprise to state that the machinery in the Hunt-street Works is over twenty years old, and consequently entirely out of date. The forcing power required is enormous, as the water has to be delivered at the top of the stand-pipe in the Mt. Auburn tank, at the extraordinary height of 311 feet above the sill in the door of the pumping house. The pressure of a column of water of that height, at rest, amounts to 135 pounds per square inch. With the friction due to the action of the pumps, in general use, it reaches 152 pounds. With the additional friction that follows, when the Worthington pumps are also used, it rises to 170 and 175 pounds. The direct connection of the force mains with the delivery mains in the streets, in addition, introduces uncertain elements in the return pressure on the pumps that continually test the integrity of the valves and wear out the machinery, to the hazard of the supply.

It may be remarked that in the comparison between the years named 1892 has no advantage (at Hunt Street) over 1891 in regard to heating the water fed to the boilers, as a heater that delivers the water at a temperature of 180 degrees has been in use in the works for many years.

The Hunt-street Pumping Works supply coal to the Mt. Auburn tank, Elsinore, and the extension service. It is furnished on application without a written requisition. The amount is small and has not exceeded a dozen tons each year; but the rule should be imperatively enforced that no one in charge of supplies should be required by custom or otherwise to give up possession of the same except upon a written order. If the urgency is so great that it is impracticable at the time to procure an order from the proper officer, it should afterward be obtained and filed in the works as a receipt. This want of system stands in the way of a correct accounting in the office for the consumption of supplies in the various departments of the service.



**THE FRONT-STREET PUMPING WORKS.**

This house is chiefly known abroad as a museum in which the remains of a number of ambitious projects, devised by misguided engineers, are kept as object-lessons for their successors. These specimens of ill-directed skill and fine workmanship are the legitimate outcome of a local concentration of ideas that failed to take account of types of engines and pumps devised and tested elsewhere—it may be added, at the expense of other municipalities. The city has paid dearly for a series of experiments dominated largely by individual vanity and the desire of making something monumental. Engineering experts differ as to details, but they agree in saying that each machine shows the entire inability of its designer to exhibit on a large scale whatever capacity he may have had to design one on a small scale.

Ill adapted as the machines are for the work they are intended to do, or at least to perform it economically, one soon discovers on inquiry that they have the merit of being documentary evidence of the highest order. They are supposed to illustrate all the faults that machinery of their class can possibly have. In one the dimensions of the steam cylinders is said to exceed the size required for the pump; in another the defect is reversed. In five out of nine engines on the floor of the house, the stroke of the piston is, according to modern ideas, disproportionately long for the diameter. The engine of the greatest size, the "Shields," has the gravest defect. From considerations of safety, a clearance variously reported from fifteen inches to two feet must be maintained at the end of the stroke. As a consequence, there is a waste of live steam sufficient to run the Harkness and Powell engines, and leave a large surplus in addition. In these engines, the two oldest in the house, the air-pumps for the condensers are so preposterously large that a good share of the power used is required to operate them. They are steam-wasters of the first-class, and rival the Scowden engines in this respect.

If the catalogue of the defects in the engines of home construction does not sustain the charge in the indictment, the machines designed abroad may supply the deficiency. In one engine the pumps were inefficient, and had to be reconstructed at great cost. The larger engine and pump—the most scientifically-designed machine in the house—is, from the length of its attachments and the difficulty of maintaining the alignment of its sections, liable to a breakage that has

crippled it for months at a time. The consequences of a fracture of its piston-rod are startling as well as costly.

Material parts have been taken out and new ones devised and substituted in nearly every machine in the house. To these unfortunate conditions must be added the defective foundations which support seven of the nine engines on the floor of the engine-room. One has a framework of iron inadequate to support its weight and counteract the strain due to the movement of its piston and fly-wheel.

With the exception of the Worthington and Wetherill engines, the machinery does not conform to modern ideas. These engines are the only ones in the house worked by double expansion, and their cylinders are the only ones provided with steam jackets. Triple expansion, with its saving from eighteen to twenty-four per cent over double expansion, has not been attempted. If steam at a pressure of 170 pounds to the inch could be had, the experiment should be made. This means a new battery of boilers, for without it the best effects of triple expansion would be unattainable. With triple expansion engines an enormous saving in fuel might be hoped for. Independently of the economy, the situation is grave, for the city is never removed from the peril of a water famine by more than a week's time.

I hoped to be able to present an estimate of the number of pounds of coal used, per indicated horse-power, per hour. Mr. Meredith has, however, been engaged in starting the engines at the Mount Hope Pumping Station, and was unable to take the diagrams upon which the calculation would have to be based. If his estimate of the horse-power in the house is not entirely incorrect, six, if not seven, pounds of coal per horse-power per hour were consumed in 1891. The variation between this rate of consumption and the results achieved by triple expansion engines, ranging from 1.33 to 1.87 pounds per hour, per indicated horse-power, shows a frightful waste of coal by the use of antiquated engines, under a system which always patches up and repairs, to avoid the purchase of new machinery.

The question in regard to the introduction of triple expansion engines is an interesting one. The condition under which the work is done at the Front-street Works are peculiar, and these inherent difficulties supplement the ordinary ones that interfere with the working of hydraulic machines. A consideration more general, however, presents itself. The Worthington engine was built by makers of great reputation and vast experience, guided also by the highest scientific knowledge, as one can see by a glance at its well-designed

steam cylinders and noble surface condenser. One fact in regard to it is obvious, and it is easily seen separates it from all the other engines in the house; its piston speed at twelve revolutions is but eighty-eight to ninety-six feet per minute. The pump is large; but is this slow movement a necessary condition in a hydraulic machine? As triple expansion is in marine engines always coupled with great piston speed—sometimes reaching 800 feet or more per minute—the inquiry naturally follows, Can triple expansion at low speed achieve the same economic results as in marine engines moving at high speed?

One important fact should be noted: the inefficiency in the apparatus is largely confined to the hydraulic parts of the machines. If the steam engines showed the effect of time and usage in a corresponding degree, the condition of the Front-street Works would be deplorable indeed. The cost of the repairs to the pumps is enormous and disproportionately large in the larger machines. In fact, the inference is strong, that pumps that exceed twenty-two or twenty-four inches in diameter are operated at a cost of delay and expense for repairs and repacking that largely offsets, if it does not entirely over-balance, the supposed advantages derived from their greater size. The huge dimensions of the castings required when any important part is broken make heavy drafts on the receipts of the department. A section of the largest pump in daily use calls for nine months' time to make and dry the enormous construction of brick and plaster demanded for its reproduction.

The smaller engines and pumps in the auxiliary plant, hastily gathered together in an emergency, and also those in the pumping-boat house, have unquestionably performed good service. There is sufficient evidence to support a good part of the claims set up on behalf of these engines, in despite of the distrust which the record of their performance naturally inspires. The economy with which they are operated is quite another matter. They undoubtedly pump water in great quantity, and after breakage are soon again in commission; but the work is not cheaply done, and can not be under the conditions under which it is performed. The steam is raised in costly fashion, in locomotive boilers that are necessarily placed at a great distance from the engines. These boilers do not supply the steam-pressure required, and a connecting pipe from the main battery of boilers within the house furnishes the additional pressure that is needed to do the work. There is a considerable loss due to the great length of pipe

through which the steam travels, that is an important factor that adds greatly to the cost of running the auxiliary plant. The comparatively greater cost of operating steam engines of small size, added to the fact that the boiler-pressure of 120 pounds falls to 110 pounds at the gauge near the engines, unquestionably overbalances the advantages derived from the greater ease with which the engines and pumps can be taken apart, re-packed, and repaired.

In this matter, as in most other things, the medium between the petty and the gigantic becomes the better object of attainment. While it is true that economy in the use of steam power increases with increased dimensions in the engines, the statement is to be accepted only with the proviso that the larger engine shall be as fortunately proportioned in all its parts and as well designed in every respect as its smaller competitor. Increased dimensions in the pumps can be attained only under precisely similar conditions; increased size carries with it equal hazards. In either pump or engine a very small fraction of error is likely to produce extremely disastrous results. Stupendous size opens the way for stupendous blunders; and it might be advisable in the future to remember that the object of a waterworks is not to astonish the occasional visitor, but to pump water at the lowest possible cost to the consumer.

I have seen nothing at the Front-street Works that has given me the idea of neglect. The machinery is in charge of careful, intelligent men, who take pride in their work and keep their engines in perfect order. When occasion demands, Mr. Meredith is on duty day and night, without sleep or rest, until the difficulty is overcome. Mr. Tharp's personal oversight and the efforts he has made in times of peril and threatened disaster are too well known to need to be repeated here. The plant is an immensely valuable one in the sense of its necessity to the welfare of Cincinnati. The citizens who think it is in the hands of political bummers are entirely in the wrong; but this opinion does not prevent me from having very positive convictions in regard to the faults of its management. One thing is felt and seen everywhere about the works; it is the exclusive dominance of the ideas of the practical man. A disregard of scientific knowledge is freely expressed and the expert engineer has no standing in court. While the shortcomings of theoretical knowledge must be admitted, it is the union of the ideas of the practical and the scientific man that produces the best economic results. Mr. Tharp is a man of great energy, will, and honesty of character as well as intelligence, and a change in his



philosophy, his way of looking at things, as one might say, will make him entirely the right man in the right place.

In the past there seems to have been little that was either scientific or practical. It seems incredible that a building in which heavy castings were continually moved should have remained unprovided with a steam capstan until it was introduced within the last twelve months by Mr. Tharp and Mr. Meredith. The economy of time, when delay is so costly, and also of labor, must be very great, while the cost of putting in the device has not greatly exceeded one thousand dollars.

The supplies for use in the works are kept in good order, and arranged in business-like fashion.

One question has suggested itself every time I have passed through the house: Why should the coal used for the auxiliary engines be so carefully separated when the steam from the boilers enters a pipe common to these engines and those in the house? Does the labor and cost of the separation of coal for the respective batteries in the house serve any useful end, except when made for the purpose of a special test or comparison?

It may be remarked that Mr. Tharp is not chargeable with the error of making cheap repairs—a most expensive form of economy. What he does is well done.

The difficulties to be overcome at the Front-street Pumping Works are very great. Water weighted with mud from the banks of the Ohio River has to be pumped at a distance of nearly sixty-five feet below the floor of the building. The existence of this great amount of foreign matter in the water accounts largely for the failures in the machinery, and is a fact that has, perhaps, not been sufficiently considered by the non-resident designers of the engines and pumps. The enormous difference of level between low-water mark and the inlet at the Eden-Park reservoir (248.73 feet) is exceptional among the great waterworks of the world. When the Ohio is low, the pumps force water to this great height, without any relieving pressure from the water in the channel in the river.

The mere weight of water rising to a height of 248.73 feet amounts to 107.65 pounds per square inch, and the additional pressure due to friction adds greatly to the load that has to be overcome. During low water, in the absence of pressure from the water in the channel, suction through the tunnel becomes difficult, and the pumps are rendered inefficient through imperfect filling.

When the water is high other difficulties have to be met. At an



extremely high stage of the Ohio repairs to the pumps become entirely impossible. At a moderate stage the pumps are covered with water many feet in depth, but the repairs can still be effected after the water has been pumped out of the hold, as the part of the building below the floors is called. The walls are practically watertight, and the water can easily be lowered by the pumps; but the means used create a new peril that is possibly more dangerous than the condition it avoids. The water within the building has been reduced to eight feet when the gauge showed forty-two feet in the river outside. It may be imagined that the situation was not reassuring, with thirty-four feet of water in the channel pressing against the walls of the building, with a rapid current in the wide river in front of it, producing a pressure at that depth equal to one ton for every square foot of wall surface.

Another point has to be considered: it is the unequal conditions of pressure due to the enormous rise and fall of the Ohio River, greater than at any other point on its banks, and exceeding the rise and fall of any other large river in the world. At one stage of the river the pumps are raising water from a level below them, while at another stage they are subjected to a pressure of the water above them that creates wholly different conditions and subjects the machinery to a strain of an entirely different kind. The conflicting pressure interferes with the seating of the valves and affects the delivery of the pumps. Continual thought in regard to the running of the engines becomes a necessity with the continually changing level of the river.

Why tunnels were built to give the pumps a water supply when canals of equal width, extending to the walls of the building (with removable covering, as suggested by Mr. Tharp), does not appear. In addition to the greater cost of construction, the keeping of the tunnels free from mud entails annually an expense that is no insignificant matter. The deposit has to be lifted out in buckets, when it could be dredged, at much less cost, from a boat, if it were taken out of a canal. The process of raising the mud in buckets is an extremely expensive one when the mud accumulates in the tunnel, as it often does, to a depth of five or six feet.

#### LEAD BILLS.

The bills for lead bought for the department may be given as instances of evasions of the law that requires all purchases of supplies

exceeding \$500 in value to be advertised and awarded to the lowest bidder.

The memorandum-book at the office shows entries of lead received as follows :

April 29, 1891,	375 bars. . . . .	weight 32,145 pounds.
August 6, 1891,	405 " . . . . .	" 33,470 "
Nov. 20, 1891,	400 " . . . . .	" 33,677 "
March 22, 1892,	375 " . . . . .	" 32,035 "

The vouchers for the metal are as follows :

4,786, April 28, 1891, C. G. Blake, 10,714 pounds at \$4.45, \$476.77.  
Bill approved May 14, 1891.

4,819, April 27, 1891, C. G. Blake, 10,716 pounds at \$4.45, \$476.86.  
Bill approved May 21, 1891.

4,833, April, 1891, C. G. Blake, 10,714 pounds at \$4.45, \$476.77.  
Bill approved May 28, 1891.

A bill in gross, dated April 29, 1891, for 32,144 pounds at \$4.45, \$1,430.40, being the aggregate of the three bills, was attached to one of the vouchers.

5,124, August 6, 1891, C. G. Blake, 10,410 pounds at \$4.80, \$499.68. Bill approved August 20, 1891.

5,168, August 13, 1891, C. G. Blake, 10,410 pounds at \$4.80, \$499.68. Bill approved August 27, 1891.

5,190, August 20, 1891, C. G. Blake, 10,410 pounds at \$4.80, \$499.68. Bill approved September 3, 1891.

5,196, August 27, 1891, C. G. Blake, 2,102 pounds at \$4.80, \$100.90.  
Bill approved September 10, 1891.

A bill in gross, dated August 6, 1891, for 33,332 pounds at \$4.80, \$1,599.94, the aggregate of the four bills, was attached to one of the vouchers.

5,480, November 10, 1891, C. G. Blake, 10,545 pounds at \$4.55, \$479.80. Bill approved November 27, 1891.

5,509, November 17, 1891, C. G. Blake, 10,545 pounds at \$4.55, \$479.80. Bill approved December 10, 1891.

5,517, December 14, 1891, C. G. Blake, 10,546 pounds at \$4.55, \$479.84. Bill approved December 17, 1891.

No bill for gross weights and amounts was attached to the last three vouchers; the aggregate weight is 31,636 pounds and the aggregate sum \$1,439.44.

6,043, March 11, 1892, Cin. R. R. Supply Co., 10,678 pounds at \$4.25, \$453.81. Bill approved April 21, 1892.

6,062, March 14, 1892, Cin. R. R. Supply Co., 10,000 pounds at \$4.25, \$425.00. Bill approved April 29, 1892.

6,165, March 17, 1892, Cin. R. R. Supply Co., 11,356 pounds at \$4.25, \$482.63. Bill approved May 12, 1892.

No bill for gross weights and amounts was attached to the last named bills. The aggregate weight is 32,034 pounds and the aggregate sum \$1,361.44.

It will be noticed that the only "irregularity" about these bills is that two weeks instead of one was permitted to elapse between the approval of the vouchers Nos. 5,480 and 5,517 and of 6,062 and 6,165. In the case of the second and third series of bills it will be seen that the weights in the bills are less than the weights of the lead delivered.

The plea is made that no department of the city government can be carried on without ignoring the provisions of the act requiring that supplies in excess of \$500 shall be procured by advertising for bids. It is in fact systematically disregarded. It matters not whether the advertising and letting of contracts for the lead would have resulted in a saving for the department or not; the law should have been complied with and carried out to the letter. Neither can the excuse of the necessity for hasty supply be of any avail in the case of purchases of lead, as it is the business of the parties in charge to keep themselves informed when the supply of lead runs low, and advertise for it in ample time for its delivery.

As a result of inquiries made in regard to prices, a large firm of dealers in Cincinnati gave me the following as the figures at which the lead could have been delivered at the dates above named: \$4.15, \$4.60, \$4.35, and \$4.25. A company in Chicago, dealing in pig lead by the car-load, gave the following statement: First lot \$4.00 to \$4.10; second lot \$4.35 to \$4.45; third lot \$4.10 to \$4.20; and fourth lot \$3.95 to \$4.05. At the highest prices named by the Cincinnati dealers the saving would have been \$96.38, \$66.66, \$63.27, and on the fourth lot there would have been nothing saved. The aggregate of \$226.31 would, however, have amply repaid the cost of advertising for bids, which certainly would not have been one third of the sum that would have been saved. The highest prices quoted by the Chicago dealers would have been a saving of \$117.14, \$116.66, \$110.71, and \$64.06 respectively, and a total of \$408.57 on the four

lots. If a general inquiry had been made among the firms engaged in the trade, the sum last named might have been saved without the expense of advertising. This would have been a substantial if not a formal compliance with the law that would have fulfilled its intention. It was not, and the law was defied and evaded.

One peculiarity in the method adopted in dividing the bills so as to bring them within the \$500 limit strikes me as a singularly ostrich-like performance. The bills are carefully audited at separate meetings. If they are, as they assume to be, separate and distinct bills, there should be no hesitation in auditing them at the same meeting.

#### LEASES.

The following property is leased for waterworks purposes from the following named parties :

Francis D. Jones: 100 feet west side Hunt Street, extending back to west line of Sec. 7, Town. 3, Fr. Range 2, north of pumping house. Moritz Loth, original lessor, Bk. 38, p. 321, and Bk. 43, p. 251, conveyed to Samuel Fosdick, Bk. 453, p. 628. Perpetual lease. Rent \$600 per annum.

Edward Sargent: 180 by 200 feet west side Auburn Avenue. Joseph C. Butler and wife original lessors, Bk. 38, page 309. Perpetual lease. Rent \$2,400 per annum.

F. D. Jones: Office buildings, 71 by 135 feet northeast corner Seventh and Plum streets. Rent \$3,000 per annum. Lease expired October 1, 1892. Waterworks holds over by verbal agreement.

Walter St. John Jones: Lots 4 and 5 in R. Fosdick's subdivision of out-lot No. 51, 59 by 100 feet south side Charles Street, extending to North Canal Street. Rent \$480 per annum.

Wood Fosdick: Lots 34, 35, 40, and 41 in R. Fosdick's subdivision in out-lot No. 58, 50 by 190 feet north side Charles Street, extending to Twelfth Street. Five year lease from 1891. Rent present year \$1,200.

The last two leases are not on record in the Recorder's office, nor could I find copies among the papers of the Board of Administration nor in the City Auditor's box in the Safe Deposit Company. Mr. Walter St. John Jones, who is also agent for Wood Fosdick, showed me the copies he has retained of the leases.

A lot at Cumminsville has been leased from Jacob Hoffner for the small station recently built there. Rent \$20 per month.



The payments on account of all the property described made in the years 1891 and 1892 are correct.

The absence of the leases named has impressed me with the necessity of having a Custodian of Public Documents, who should make it his duty to see that copies of all contracts are filed in his office.

#### PAY - ROLLS.

Year.	Amount.	Average Number of Men.
1882.....	\$164,736 64.....	237
1883.....	201,790 95.....	296
1884.....	237,684 00.....	361
1885.....	230,546 95.....	331
1886.....	243,230 01.....	370
1887.....	228,407 60.....	328
1888.....	237,455 60.....	327
1889.....	290,902 25.....	443
1890.....	335,857 92.....	452
1891.....	373,107 70.....	499

A graphic representation of the pay-rolls during the period will be found herewith. The upper line shows the sums paid, under the respective pay-rolls, on an apportionment of one hundred dollars to a space. The highest pay-roll in each month has been taken as the foundation of the ascending and descending lines. The lower line shows the number of men employed, ten men being counted to a space.

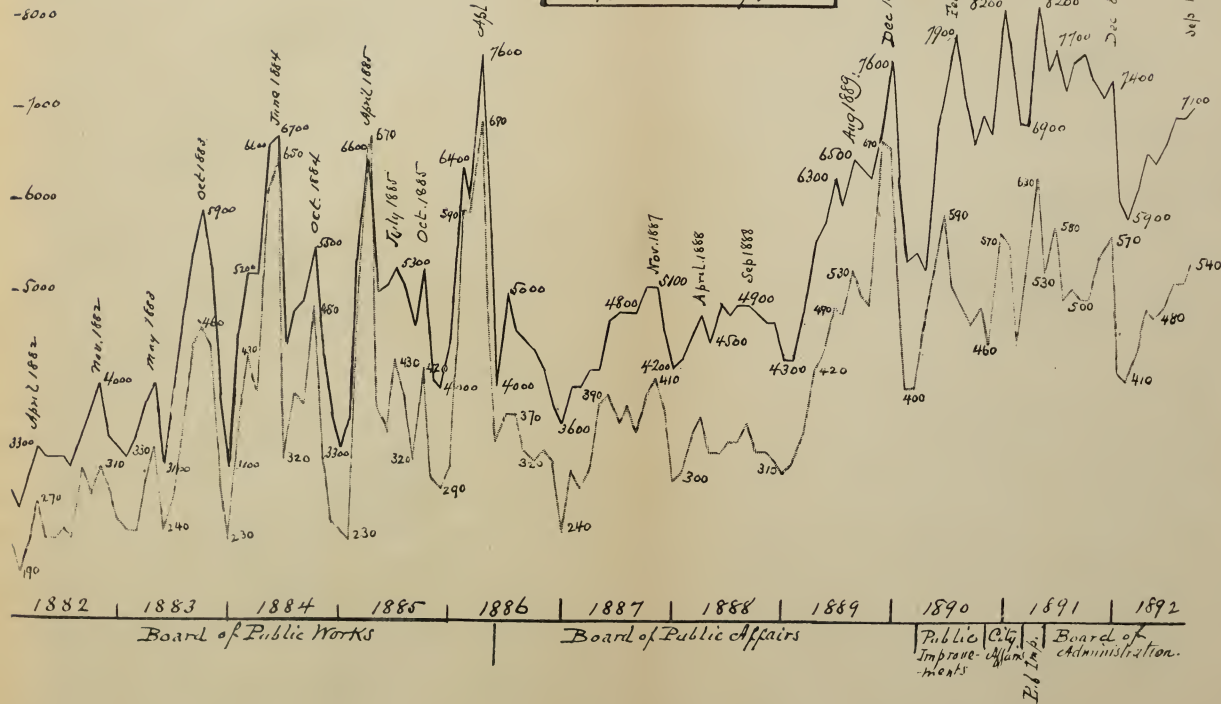
A comparison between some of the items in a weekly pay-roll in 1882 and the same items in 1892 will give an idea of the increase in the expenditures of the department.

	JANUARY 7, 1882.		JANUARY 7, 1892.	
	Number of Men.	Amount.	Number of Men.	Amount.
Superintendent's office ....	9	\$215 65	6	\$235 15
Secretary's office.....	26	471 80	34	716 25
Pumping service.....	82	1,194 30	167	2,545 45
Paving service.....	11	64 20	12	128 40
Repair service.....	14	133 30	28	359 55
Hydrant service.....	9	99 05	22	301 50
Stable service.....	4	48 00	10	160 00





WATER WORKS Pay Roll.  
Amount Weekly Payments.  
Number of Men Employed.  
1882 - 1892.



The inspection service is one that has been a favorite field for political interference. It may not have suffered more severely than any other, but it is the one in which the influence can be more easily traced through the weekly pay-rolls than in any other.

Jan. 3, 1883, 7 men .....	\$ 63 50	Jan. 5, 1889, 26 men .....	\$432 60
Jan. 20, " 5 " .....	60 00	Mar. 23, " 30 " .....	483 90
July 28, " 29 " .....	113 50	Mar. 30, " 21 " .....	342 00
Oct. 20, " 24 " .....	123 25	May 11, " 12 " .....	210 00
Jan. 13, 1884, 34 " .....	175 40	June 8, " 22 " .....	376 55
Feb. 9, " 41 " .....	297 90	Oct. 12, " 25 " .....	444 00
Feb. 16, " 55 " .....	405 75	Dec. 28, " 17 " .....	304 00
Mar. 29, " 40 " .....	223 55	April 12, 1890, 16 " .....	210 50
May 12, " 26 " .....	134 50	April 26, " 12 " .....	210 50
Sept. 13, " 53 " .....	348 40	June 7, " 17 " .....	304 00
July 18, 1885, 18 " .....	285 45	Jan. 3, 1891, 20 " .....	356 00
Aug. 21, 1886, 4 " .....	54 00	April 4, " 25 " .....	429 00
Jan. 1, 1887, 5 " .....	70 50	July 11, " 18 " .....	350 00
Feb. 3, " 7 " .....	107 00	Jan. 13, 1892, 14 " .....	235 00
July 23, " 11 " .....	171 50	Feb. 13 to } 14 " .....	245 00
Feb. 11, 1888, 21 " .....	271 50	July 2, '92, } 15 " .....	262 50
April 21, " 34 " .....	709 50	July 16 to }	
Aug. 18, " 20 " .....	315 50	Sept. 10, '92, }	

During the six months ending June 30, 1892, 1,518 applications were made to turn water off and 1,888 to turn it on. At the same rate for the latter half of the year the applications will aggregate 6,812. I have been unable to get the statistics for 1891, but the number of applications were undoubtedly fewer than in the present year. The amount charged to the account of inspection in 1891 is \$13,624, which for 6,812 applications would be an average cost of two dollars for each time water is turned off or on. The districts are larger and the territory possibly more extended than that traversed by the on-and-off men in the employ of the Cincinnati Gas Light and Coke Company. The applications for gas were, however, much more numerous. In 1891 the Gas Company answered 5,393 applications to turn gas on and 4,295 to turn it off, the aggregate being 10,688 applications, against 6,812 made to the Waterworks. The work is performed during the daytime chiefly by four men, at a cost of from one and a half to two dollars per day, and at night by a number of men who live in a tenement house leased by the Gas Company, and answer all calls after nightfall in consideration of having rooms in the building free of rent.

There is no definite separation of the expense on the books of the Gas Company, but I am entirely within bounds in saying that the cost of turning gas on and off does not exceed forty to fifty cents for each application.

**CURRENT EXPENSES.**

A comparative statement of the expenses of the department up to the dates named, during the last and the present year, is as follows:

	1891	1892	
June 30.....	\$362,509 56	\$392,980 20	Increase..\$30,470 64
July 31.....	453,314 98	453,769 48	" .. 454 50
August 30.....	639,412 49	534,051 53	Decrease. 105,360 96
Sept. 30.....	723,445 22	613,837 92	" .. 109,607 30
Oct. 31.....	822,792 02	685,426 31	" .. 137,365 72

A comparative statement of expenditures to November 1st is as follows:

**CURRENT EXPENSES.**

PUMPING SERVICE.	1891 (Twelve months).	1891 (Ten months).	1892 (Ten months.)
No. 1, Front St. (Third St.)..	74,624 70	62,888 99	42,004 96
" 2, Front St. (Eden Park)..	286,992 95	246,925 87	185,680 02
" 3, Hunt St. (Mt. Auburn)	39,005 62	33,659 06	27,210 05
" 4, Eighth St. (Price Hill)..	16,970 81	13,537 43	8,787 97
" 5, Front St. (Auxiliary)..	59,046 70	52,988 58	13,546 96
" 6, Pumping Boat.....	.....	.....	2,820 13
Machine-shop.....	8,291 71	7,072 85	6,034 19
Hydrant service.....	55,184 01	47,092 02	48,920 71
Main pipe repairs .....	26,237 45	22,290 09	20,606 53
Draughting.....	6,487 07	5,542 07	5,355 20
Stable ..	17,397 53	15,605 14	19,349 04
Office expenses.....	53,779 96	45,834 32	39,512 56
	\$644,018 51	\$553,436 42	\$419,828 32

**BETTERMENTS.**

	1891 (Twelve months).	1891 (Ten months).	1892 (Ten months).
New water tower .....	9,715 00	9,715 00	7,960 94
Eden-Park Pumping Station..	70,995 62	50,366 77	45,600 16
Gate-house, Eden Park.....	.....	.....	2,340 71
Mount Hope Station.....	.....	.....	21,430 38
Cumminsville Station.....	.....	.....	889 01
New pumping machinery....	19,146 40	17,646 40	16,338 57
Main pipe extension.....	72,109 33	64,132 26	60,768 35
Pumping Boat or Eng. No. 13	18,138 04	14,631 15	11,560 12
	\$190,104 39	\$156,491 58	\$166,888 24
Total amounts.....	\$834,122 90	\$709,928 00	\$586,716 56

**Total Payments in 1892 to November 1st.**

Current expenses.....	419,828 32
Betterments .....	166,888 24
Returned water-rents.....	11,184 75
Sinking Fund.....	23,275 00
Interest.....	64,250 00
	<hr/>
	\$685,426 31

A notable feature of this statement is that more money was expended in betterments in the ten months ending November 1, 1892 (\$166,888.24) than during the same time in 1891 (\$156,491.58), notwithstanding the fact that in July (1891) bonds were sold to provide the sum of \$200,000 to be used for that particular class of expenditures, while during the present year no money was received from the sale of bonds. The fact that current expenses were reduced in ten months from \$553,436.42 to \$419,828.32, and the large sum of \$166,888.24 expended in betterments, shows what the department can do in case of necessity. A matter of inquiry naturally suggests itself. Has this reduction been accomplished by running in debt? My answer to this question is derived partly from information and partly from inspection of accounts. The claims filed with Mr. Keating, audited and unaudited, November 29th, amounted to \$42,541.19 (exclusive of the sum to be paid for pumping engines at Mount Hope, \$6,200), which can hardly be regarded as an extraordinary amount, when the expenditures sometimes reach \$80,000 in a single month.

It will be seen by reference to the statement of current expenses that a general reduction has taken place, with the exception of the hydrant service and the stable. The amount paid on account of the hydrant service exceeds last year by the sum of \$1,828.69. In the stable the increase may be called phenomenal, as the cost for ten months is greater by the sum of \$1,951.51 than during the entire twelve months of 1891. A comparative statement of the items of expenditure in the stable is set forth in the tabular statement below.

It may be remarked that Mr. Keating's book-keeping is excellent, and his books afford every facility needed for tracing vouchers in detail. His system of keeping accounts is all that could be desired.



	1891	1892 (ten months).	
Building .....	412 86.....	1,032 22	
Ground rent .....	1,200 00.....	1,200 00	
Plumbing bills.....	30 10.....	44 58	
Fixtures .....	13 65.....	33 03	
	1,656 61		2,309 83
Coal.....	22 00.....		
Telephone.....	78 00.....	100 00	
Gas bills.....	157 47.....	154 49	
Insurance.....	111 20.....		
Ice.....	7 01.....	14 56	
Laundry bills.....	55 10.....	42 85	
Rubber boots.....	15 70.....	16 50	
	446 48		328 40
Wages.....	8,029 25		7,449 05
New buggies (2).....	340 00.....	(3) 585 00	
Repairs to buggies.....	649 55.....	1,018 20	
New wagons (2).....	370 00.....		
Repairs to wagons.....	779 10.....	961 55	
New harness.....	563 95.....	500 75	
Harness repairs.....	197 60.....	99 15	
	2,900 20		3,164 65
Horses (6).....	1,025 00.....	(12) 1,992 50	
Feed.....	2,180 33		2,650 12
Horse-shoeing.....	533 05.....	648 10	
Bedding.....	189 75.....	156 00	
Veterinary surgeon.....	50 00.....		
Veterinary supplies.....	94 35.....	170 50	
Dentistry .....	38 00.....	2 00	
	905 15		976 60
Buckets .....	2 95.....	3 50	
Sponges.....	14 95.....	21 00	
Soap.....	6 77.....		
Brooms .....	20 00.....		
Baskets .....	10 00.....	9 00	
	54 67		33 50
Board of horses at other stables	171 70.....	329 93	
Pasturage .....		27 00	
Sundries .....	28 14.....	87 46	
	199 84		444 41
	\$17,397 53		\$19,349 04

Twenty-eight horses are kept in the stable, also sixteen wagons, one dray, one drag, and ten buggies. Two of the buggies are used by members of the Board of Administration, and the cost is properly a part of the expenses of the general management of the city's affairs and not of the Waterworks. One fourth of the lot on Charles Street, extending to Twelfth Street, upon which the stable stands, is occupied by the shops of the main pipe repair, the extension, and the

hydrant services. One fourth, therefore, of the annual ground rent of \$1,200, or \$300, should be charged to other service. The amount expended for buildings is partly for account of the main pipe repair service. A considerable share of the laundry bills appears to be for washing robes for use in the buggies. An examination of all the stable bills for 1891 and 1892 enables me to say that with the exceptions named, the amounts set forth in the statement were properly chargeable against it. The sum of \$2,000 should cover all deductions.

On the basis of twenty-eight horses, the feed purchased in 1892 cost \$2,650.12, or \$9.46 per horse per month. The cost in the Street-cleaning Department is \$7.69, or \$1.77 per month less than at the Waterworks stables. Severe work is, however, exacted in the Waterworks service, which makes demands by day and by night.

In addition to the feed-bill the sum of \$329.93 was paid during the present year for the board of horses, chiefly for meals obtained when officers and employees were engaged at too great a distance to return to the Charles-street stable.

It is claimed that horses belonging to other departments of the city government are fed in the stables in addition to the twenty-eight horses that occupy the stalls. What this amounts to I am unable to state. If it would be entirely just to bring the amount of feed thus consumed into the account as a reduction of the average monthly cost of feed per horse, it would also be proper to add a certain portion of the sum of \$329.93 paid for the board of horses.

The insurance policies on the stable property contain an item of \$300, in each policy, on buildings. Why the department should insure property for which it has no title except that of tenant, and therefore no insurable interest nor right to collect money therefor in case of loss by fire, does not appear. The premium paid on this account is consequently a clear waste of money.

The receipts of the department during the ten months ending October 31, 1892, were \$693,826.23, of which amount \$643,341.76 were received from water-rents. In 1891, during the same period, the total receipts were \$660,912.91, of which amount \$609,671.16 were received for water-rents. This shows an increase in the receipts from water-rents amounting to \$33,670.60, and a decrease in the receipts other than water-rent of \$757.28.

Notwithstanding the decrease in the amount paid to carry on the department and the increase in the water-rents collected, the tax-payers

need not flatter themselves that there will be any cessation in its demands. Betterments and extensions will have to be made. A forcing main from the Front-street Works to the Eden-Park reservoir will have to be provided without delay. It is one of the absolute needs of the works. A line of pipe, thirty-six inches diameter, will cost about \$50,000.

**Comparative Statement of Income and Expenses for Ten Years.**

	Water Rents.	Expenses.	Betterments.
1882 .....	\$507,501 31	\$212,682 66	\$118,412 05
1883 .....	534,281 09	207,311 33	208,426 62
1884 .....	548,931 06	248,501 37	173,641 43
1885 .....	569,989 16	263,264 28	140,558 24
1886 .....	587,476 94	272,423 65	259,696 49
1887 .....	629,731 93	297,524 81	240,151 46
1888 .....	651,028 34	271,730 79	407,367 22
1889 .....	682,319 45	288,385 35	320,059 32
1890 .....	605,018 44	491,694 10	126,834 67
1891 .....	719,109 15	644,018 51	190,104 39

While making this examination I have been treated with entire courtesy by Mr. Tharp and every one connected with the department, and have found no disposition to keep back information. Books, papers, and vouchers, unless in actual use at the time, and it was obviously inconvenient to furnish them, were freely offered for inspection when demanded. I wish particularly to express my thanks to Mr. Keating and Mr. Elsbach in the Secretary's office, Mr. D. Murphy of the hydrant and meter service, Mr. Meredith of the Front-street Works, and Mr. Everson of the Hunt-street Pumping House.

I have endeavored to make this report as complete as possible, as far as it goes. Within the limits of the time assigned to me, it was clearly impracticable to look into all the matters connected with a business that does not fall far below a million of dollars a year. It must be remembered that I took charge of the investigation single-handed and alone. The examination that a business man would make is the one which I understood the Board required. It has been made as far as my capacity admits, and nothing has been concealed or glossed over. In the beginning it was clearly apparent that some limitation of its scope was necessary, otherwise the field would become too vast. It has, therefore, been practically confined to the years 1891 and 1892, and a few only of the more important features examined.

What the management of the department has been in the past I am unable to judge, except from an examination of the pay-rolls of the last ten years, made for the purpose of comparison. To say that it has been or is now economically managed would be a misuse of words. If the cause that has contributed the most to this state of things is demanded, pre-eminence must be assigned to one: it is the condition of continual change that has affected its administration. Men could not be expected to take an interest in their work under this state of things. A recapitulation of the titles of the public boards that have had charge of the affairs of the Waterworks from 1882 to 1892 may, perhaps, sufficiently explain the situation, and bring back matters of the past that may already have begun to fade from the memory of the average citizen, who takes no active part in political affairs:

1. Board of Public Works.
2. Board of Public Affairs, took charge June 1, 1886.
3. Board of Public Improvements, took charge March 17, 1890.
4. Board of City Affairs, took charge November 11, 1890.
5. Board of Public Improvements, reinstated March 13, 1891.
6. Board of Administration, took charge May 4, 1891.

Under these conditions of multiplied change the wonder is that the work of the department has been as well attended to as it has been. During the rapid transformation scenes that have taken place in the last three years, the chief concern of members of boards, officers of departments, clerks, and employees of all kinds must have been to keep their political heads on their political shoulders. Carelessly as the department has, in many respects, been managed, it is truly a matter of astonishment that its affairs have not fallen into utter confusion.

Very respectfully submitted,

GEO. McLAUGHLIN.

CINCINNATI, December 2, 1892.



## EXHIBIT A.

## LIST OF VOUCHERS FOR COAL DELIVERED

IN 1891 AND 1892, MEASURED IN TONS OF 2,000 POUNDS.

## COAL DELIVERED IN 1891.

Voucher.	Date.	Name.	Tons.	Coal.	Delivery.	Price.	Amount.
4257	Jan. 5	Brown ...	662.500	Yough ..	Front st....	\$1 87	\$1,238 41
4257	" 5	"	1.150	Piedm'nt	"	4 00	4 30
4258	" 5	"	50.500	Yough ..	Hunt st....	2 35	118 09
4288	" 12	"	756.1380	"	Front st....	1 87	1,415 01
4298	" 12	"	73.450	"	Hunt st....	2 35	172 08
4299	" 19	"	647.460	"	Front st....	1 87	1,210 32
4299	" 19	"	1.100	Piedm'nt	"	4 00	4 20
4300	" 26	"	77.550	Yough ..	Hunt st....	2 35	181 60
4335	" 19	"	81.1600	"	"	2 35	192 23
4336	" 26	"	745.890	"	Front st....	1 87	1,393 98
4336	" 26	"	1.200	Piedm'nt	"	4 00	4 40
4337	Feb. 2	"	215.740	Yough ..	"	1 87	402 74
4338	" 2	"	64.1440	"	Hunt st....	2 35	152 09
4341	Jan. 31	Carlisle...	44.1950	Peach Or	Eighth st...	2 22	99 83
4389	Feb. 1	Kineon ...	8.	Yough ..	7th and Plum	2 75	22 00
4389	" 1	"	4.	"	Hyd. serv...	2 75	11 00
4389	" 1	"	8.	"	Main pipe ex	2 75	22 00
4442	" 2	"	539.180	"	Front st....	1 87	1,008 09
4443	" 25	"	74.998	"	Hunt st....	2 35	175 07
4451	" 9	"	650.850	"	Front st....	1 87	1,216 29
4452	" 16	"	644.30	"	"	1 87	1,204 31
4472	" 16	"	65.990	"	Hunt st...	2 35	153 91
4473	" 23	"	88.500	"	"	2 35	207 39
4474	" 23	"	642.1610	"	Front st....	1 87	1,202 05
4475	Mar. 2	"	610.960	"	"	1 87	1,141 60
4550	" 2	"	59.1503	"	Hunt st....	2 35	140 42
4551	" 2	"	4.147	"	"	2 35	9 57
4552	" 7	"	641.1460	"	Front st....	1 87	1,200 04
4553	" 9	"	2.	.....	Mt. Aub. tk.	3 25	6 50
4553	" 9	"	73.930	Yough...	Hunt st....	2 35	172 65
4556	Feb. 28	Carlisle ..	42.1550	Peach Or	Eighth st...	2 22	94 96
4556	" 28	"	2.300	"	Price Hill tk.	2 47	5 31
4578	" 5	Kineon...	71.1136	Coke....	Front st....	4 72	337 97
4579	" 28	"	8.	Yough ..	7th and Plum	2 75	22 00
4579	" 28	"	8.	"	Chas. st. yd.	2 75	22 00



Voucher.	Date.	Name.	Tons.	Coal.	Delivery.	Price.	Amount.
4579	Feb. 28	Kineon ...	68.1808	Coke....	Front st....	\$4 72	\$325 38
4580	" 28	"	19.525	Anthra..	"	6 50	123 50
4580	" 28	"	42.690	Coke....	"	4 72	199 92
4580	" 28	"	.1800	"	7th and Plum	3 50	5 00
4607	Mar. 16	Brown....	631.310	Yough ..	Front st....	1 87	1,180 26
4607	" 16	"	2.350	Piedmo't.	"	4 00	8 70
4608	" 16	"	70 845	Yough ..	Hunt st....	2 35	165 49
4645	" 19	"	153.1500	"	Front st....	2 43	373 61
4645	" 19	Addition'l rate on 7	prev. lots.	"	"	56	2,441 43
4645	" 18	Brown....	34.940	Yough ..	Hunt st....	2 65	91 35
4645	" 18	Addition'l rate on 3	prev. lots.	"	"	30	61 09
4652	" 21	Consol'd..	521.150	Yough ..	Front st....	2 43	1,266 21
4653	" 21	"	55.350	"	Hunt st....	2 65	146 22
4654	" 1	Kineon....	4.	"	Chas. st. yd.	2 75	11 00
4654	" 1	"	8.	"	7th and Plum	2 75	22 00
4654	" 1	"	4.	Piedm'nt	Front st....	4 00	16 00
4654	" 1	"	14.180	Anthra..	"	6 00	84 54
4654	" 1	"	22.148	Coke....	"	4 72	104 24
4657	" 28	Consol'd..	71.1430	"	Ninth st....	4 72	190 04
4658	" 28	"	749.1240	Yough ..	Front st....	2 43	1,821 58
4671	Apr. 6	"	60.200	"	Hunt st....	2 65	159 27
4672	" 6	"	735.230	"	Front st....	2 43	1,786 32
4673	" 11	"	70.1030	"	Hunt st....	2 65	186 86
4674	" 11	"	659.300	"	Front st....	2 43	1,601 73
4678	Mar. 31	Carlisle...	46.1550	Peach Or	Eighth st...	2 22	103 84
4742	Apr. 18	Consol'd..	877.1780	Yough ..	Front st....	2 43	2,133 27
4743	" 18	"	71.1270	"	Hunt st ..	2 65	189 83
4743	" 2	"	2 775	"	Mt. Aub. tk.	3 25	7 75
4748	" 1	Kineon....	38 670	Anthra..	Front st....	6 00	230 01
4748	" 1	"	4.	Yough ..	7th and Plum	2 75	11 00
4748	" 1	"	2.	"	12th st. yard	2 75	5 50
4748	" 1	"	2.	"	Stable .....	2 75	5 50
4755	" 25	Consol'd..	982.750	"	Front st ...	2 43	2,387 17
4756	" 25	"	67.145	"	Hunt st....	2 65	177 74
4764	May 2	"	99.480	"	"	2 65	262 99
4765	" 2	"	1,007.1610	"	Front st....	2 43	2,448 97
4766	" 30	Carlisle...	46.1600	Peach Or	Eighth st...	2 22	103 90
4774	" 30	Kineon....	4.	"	7th and Plum	2 75	11 00
4774	" 30	"	4.	"	Stables.....	2 75	11 00
4774	" 30	"	3.	Piedm'nt	Main pipe ex	4 00	12 00
4788	May 9	Consol'd..	1,064.1500	Yough ..	Front st....	2 43	2,587 34
4789	" 9	"	81.950	"	Hunt st....	2 65	215 91
4821	" 16	"	86.390	"	"	2 65	228 42
4822	" 16	"	1,021.830	"	Front st....	2 43	2,482 04
4834	" 16	"	77.1655	"	Hunt st....	2 65	206 24
4835	" 23	"	1,011.1500	"	Front st....	2 43	2,458 55
4850	" 27	Carlisle...	57.370	"	Eighth st...	2 22	126 95
4855	" 18-26	Kineon....	3.625	Piedm'nt	Front st....	4 00	13 25
4865	" 30	Consol'd..	1,240.400	Yough ..	"	2 43	3,013 69
4866	" 30	"	79.140	"	Hunt st....	2 65	209 54
4871	June 6	"	918.1535	"	Front st....	2 43	2,232 61
4872	" 6	"	78.249	"	Hunt st....	2 65	207 03

Voucher.	Date.	Name.	Tons.	Coal.	Delivery.	Price.	Amount.
4921	June 13	Consol'd..	1,219.735	Yough ..	Front st....	\$2 43	\$2,963 06
4922	" 13	"	92.1765	"	Hunt st....	2 65	246 14
4924	" 16	Brown....	56.1950	"	Front st....	3 00	170 93
4925	" 15	"	58.720	"	"	3 00	175 08
4926	" 17	Brown....	85.435	Yough ..	Front st....	3 00	255 65
4931	" 20	Consol'd..	52.530	"	Hunt st....	2 65	138 50
4932a	" 20	"	200.	"	Front st....	2 43	486 00
4932b	" 20	"	200.	"	"	2 43	486 00
4932c	" 20	"	110.1920	"	"	2 43	269 63
4933	" 20	Brown....	75 1060	"	"	3 00	226 59
4934	" 10	"	65.1350	"	"	3 00	197 03
4935	" 18	"	75.1270	"	"	3 00	226 91
4936	" 20	"	114.350	"	"	3 00	342 53
4937	" 23	"	45.530	"	"	3 00	135 80
4938	" 19	Kineon...	82.900	"	"	3 00	247 35
4938	" 19	"	4.775	"	Hunt st....	3 00	13 16
4939	" 20	"	138.240	"	Front st....	3 00	414 36
4939	" 20	"	20.1728	"	Hunt st....	3 00	62 59
4940	" 22	"	144.120	"	Front st ...	3 00	432 18
4940	" 22	"	16.1025	"	Hunt st....	3 00	49 53
4941	" 16	"	2.475	Piedm'nt	Front st....	4 00	8 95
4941	" 21	"	56.1950	Yough ..	"	3 00	170 92
4942	" 18	"	63.510	"	"	3 00	189 76
4942	" 18	"	16.1190	"	Hunt st....	3 00	49 78
4950	" 24	Brown....	48.1610	"	Front st....	3 00	146 42
4951	" 27	Kineon...	118.155	"	"	2 90	342 43
4952	" 28	"	162.635	"	"	2 90	470 72
4953	" 27	"	51.320	"	Hunt st....	2 90	148 36
4954	" 26	"	142.180	"	Front st....	2 90	412 06
4955	" 26	"	17.840	"	Hunt st....	2 90	50 52
4956	" 25	"	27 710	"	"	2 90	79 33
4957	" 23	"	116.1875	"	Front st....	2 90	339 12
4958	" 23	"	20.1970	"	Hunt st....	2 90	60 85
4959	" 24	"	138.1415	"	Front st....	2 90	402 25
4960	" 24	"	8.1045	"	Hunt st....	2 90	24 72
4961	" 25	"	144.225	"	Front st....	2 90	417 93
4966	July 6	"	109.585	"	"	2 90	316 95
4967	" 3	"	47.25	"	"	2 90	136 33
4968	" 4	"	72.1935	"	"	2 90	211 60
4969	" 2	"	87.1715	"	"	2 90	254 78
4970	" 5	"	109.1050	"	"	2 90	317 62
4971	" 3	"	109.80	"	"	2 90	316 22
4972	" 6	"	80.1160	"	"	2 90	233 68
4973	June 30	"	114.210	"	"	2 90	330 90
4974	" 30	"	107.885	"	"	2 90	311 58
4975	July 1	"	104.50	"	"	2 90	301 67
4976	" 2	"	97.485	"	"	2 90	282 00
4977	June 29	"	95.940	"	"	2 90	276 87
4978	" 29	"	55.770	"	Hunt st....	2 90	160 62
4979	" 29	"	88.525	"	Front st....	2 90	255 97
4980	" 30	Carlisle ..	57.1590	Peach Or	Eighth st....	2 22	128 30
4981	July 1	Kineon...	92.1150	Yough ..	Front st....	2 90	268 47

Voucher.	Date.	Name.	Tons.	Coal.	Delivery.	Price.	Amount.
4991	May 4	Marmet ..	0.1800	Coke....	Front st ...	\$4 44	\$4 00
4991	" 23	"	4.	Yough ..	12th-st. yard	3 00	12 00
5001	July 11	Kineon...	151.55	"	Front st....	2 90	437 98
5002	" 10	"	157.530	"	"	2 90	456 07
5003	" 8	"	171.470	"	"	2 90	496 58
5004	" 7	"	162.860	"	"	2 90	471 05
5004	" 3	"	2.200	Piedm'nt	Front st. shp	4 00	8 40
5005	" 9	"	169.1885	Yough ..	Front st....	2 90	492 83
5006	June 30	"	126.165	"	Hunt st....	2 90	365 64
5069	July 12	"	36.1215	"	Front st....	2 90	106 17
5070	" 13	"	75.510	"	"	2 90	218 24
5071	" 13	"	115.1910	"	"	2 90	336 39
5072	" 6-11	"	88.1115	"	Hunt st....	2 90	256 82
5084	" 20	Consol'd..	1,029.180	"	Front st....	2 43	2,500 69
5093	" 25	"	892.505	"	"	2 43	2,168 17
5094	" 25	"	63.980	"	Hunt st....	2 65	168 25
5095	" 20	"	92.980	"	"	2 65	245 09
5096	" 1-31	Carlisle ..	58.685	Peach Or	Eighth st...	2 22	129 52
5108	Aug. 1	Consol'd..	1,137.955	Yough...	Front st....	2 43	2,764 07
5109	" 1	"	81.170	"	Hunt st....	2 65	214 88
5115	" 15	"	104.1585	"	"	2 65	277 70
5116	" 17	"	1,130.925	"	Front st....	2 43	2,747 02
5117	" 8	"	1,166.170	"	"	2 43	2,833 59
5118	" 8	"	70.580	"	Hunt st....	2 65	186 27
5119	July 18	Kineon...	2.	Piedm'nt	Front st. shp	4 00	8 00
5120	" 3	Marmet...	0.1800	Coke....	Front st....	4 44	4 00
5148	Aug. 22	Consol'd..	80.1295	Yough ..	Hunt st. ...	2 65	213 72
5149	" 22	"	1146.1975	"	Front st....	2 43	2,787 18
5176	" 29	"	80.380	"	Hunt st....	2 65	212 50
5177	" 29	"	1,225.1685	"	Front st....	2 43	2,978 80
5201	Sep. 5	"	101.1330	"	Hunt st....	2 65	269 41
5202	" 5	"	1,086.1805	"	Front st....	2 43	2,641 17
5216	" 12	"	57.1110	"	Hunt st....	2 65	152 52
5217	" 12	"	939.1495	"	Front st....	2 43	2,283 59
5232	" 19	"	88.1495	"	Hunt st....	2 65	235 18
5233	" 19	"	1,071.105	"	Front st....	2 43	2,602 65
5250	Aug. 4	Kineon...	1.	Piedm'nt	Front st....	4 00	4 00
5250	" 17	"	2.350	"	"	4 00	8 70
5250	" 31	"	4.	Yough ..	Hunt st....	3 50	14 00
5261	" 6	Marmet	4.	"	12th-st. yard	3 00	12 00
5306	" 31	Carlisle...	61.1985	Peach Or	Eighth st...	2 22	137 52
5334	Sep. 27	Consol'd..	1,054.1500	Yough ..	Front st....	2 43	2,563 04
5335	" 26	"	76.1705	"	Hunt st....	2 65	203 60
5345	Oct. 3	"	957.1310	"	Front st....	2 43	2,327 10
5346	" 3	"	81.445	"	Hunt st....	2 65	215 24
5347	Sep. 1-30	Carlisle...	62.1740	Peach Or	Eighth st...	2 22	139 57
5355	" 5-22	Kineon...	12.725	Yough ..	Eden Park Res'r..	3 00	43 26
5355	" 5-22	"	3.750	Piedm'nt	Front st....	4 00	13 50
5369	Oct. 10	Consol'd..	73.1975	Yough ..	Hunt st....	2 65	196 07
5370	" 11	"	1,112.440	"	Front st....	2 43	2,702 70
5396	" 17	"	78.465	"	Hunt st....	2 65	207 32
5397	" 18	"	993.1455	"	Front st....	2 43	2,414 76

Voucher.	Date.	Name.	Tons.	Coal.	Delivery.	Price.	Amount.
5434	Oct. 24	Consol'd..	1,015.515	Yough...	Front st....	\$2 43	\$2,467 08
5435	" 24	"	74.1855	"	Hunt st....	2 65	198 56
5447	" 31	"	83.1720	"	"	2 65	222 23
5448	" 31	"	1,040.960	"	Front st....	2 43	2,528 37
5457	Nov. 7	"	801.1655	"	"	2 43	1,948 44
5458	" 7	"	61.545	"	Hunt st....	2 65	162 37
5459	Oct. 1-31	Carlisle...	58.1530	"	Eighth st...	3 25	190 98
5459	" 1-31	"	2.250	"	Price-Hill tk	3 50	7 44
5461	" 10	Marmet ..	4.	"	12th-st. yard	3 00	12 00
5461	" 30	"	4.	"	"	3 50	14 00
5473	Nov. 14	Consol'd..	887.1555	"	Front st....	2 43	2,157 30
5474	" 14	"	79.940	"	Hunt st....	2 65	210 60
5481	" 23	"	827.1110	"	Front st....	2 43	2,010 96
5482	" 23	"	64.160	"	Hunt st....	2 65	169 81
5492	" 28	"	865.1320	"	Front st....	2 43	2,103 55
5493	" 28	"	74.1255	"	Hunt st....	2 65	197 76
5510	Dec. 5	"	776.1430	"	Front st....	2 43	1,887 42
5511	" 5	"	72.715	"	Hunt st....	2 65	191 75
5521	Mar 2-30	Carlisle...	50.1630	Peach Or	Eighth st...	3 25	165 15
5522	Dec. 12	Consol'd..	67.75	Yough ..	Hunt st....	2 65	177 65
5523	" 12	"	789.180	"	Front st....	2 43	1,917 49
5529	Nov. 17	Kineon...	4.	"	Eden-Pk res.	4 00	16 00
5529	" 17	"	4.	"	Eighth st...	3 50	14 00
5529	" 30	"	4.	"	12th-st. yard	3 00	12 00
5529	" 23	"	2.180	Piedm'nt	Front st....	4 00	8 36
5530	" 14	"	4.1150	"	"	4 00	18 30
5530	" 14	"	4.	Yough ..	7th and Plum	4 00	14 00
5534	" 12	Marmet ..	4.	"	"	3 50	14 00
5534	" 25	"	4.	"	"	3 50	14 00
5534	" 17	"	4.	"	"	3 50	14 00
5534	" 21	"	0.1800	Coke....	Front st....	4 44	4 00
5550	Dec. 19	Consol'd..	872.250	Yough ..	"	2 43	2,119 26
5551	" 19	"	72 1930	"	Hunt st....	2 65	193 36
5554	" 19	R Schmidt	4.	"	Front st....	2 50	10 00
5563	" 26	Consol'd..	776.950	"	"	2 43	1,886 83
5564	" 26	"	81.440	"	Hunt st....	2 65	215 23
5565	" 21	"	130	"	Front st....	2 43	315 90
5572	" 31	Carlisle...	56.375	Peach Or	Eighth st...	2 75	154 52
5572	" 31	"	2.	"	Price-Hill tk	3 00	6 00
5621	" 12	Kineon...	4.	Piedm'nt	12th-st. yard	3 00	12 00
5621	" 15	"	4.	"	"	3 00	12 00
5621	" 19	"	1.	"	Front st....	4 00	4 00
5627	" 28	Marmet ..	8.	Yough ..	7th and Plum	2 75	22 00
			53.370				\$131,885 14
			742				
			2000				

## COAL DELIVERED IN 1892.

Voucher.	Date.	Name.	Tons.	Coal.	Delivery.	Price.	Amount.
5566	Jan. 2	Consol'd..	766.1540	"	Front st....	\$2 43	\$1,863 25
5567	" 2	"	107.635	"	Hunt st....	2 65	284 39
5570	" 9	"	88.1240	"	"	2 65	234 84
5571	" 9	"	760.205	"	Front st....	2 43	1,847 05
5597	" 16	"	59.1615	"	Hunt st....	2 65	158 49
5598	" 16	"	745.1670	"	Front st....	2 43	1,812 38
5666	" 25	Brown....	271.290	"	"	1 75	474 50
5668	" 23	Consol'd..	653.1430	"	.....	2 43	1,588 53
5669	" 23	"	63.75	"	Hunt st....	2 65	167 05
5669	" 23	"	2.500	"	Hunt-st. tk..	3 50	7 88
5714	" 23	"	303.1195	"	Front st....	1 93	585 94
5715	" 30	"	80.985	"	Hunt st....	2 65	213 31
5716	" 30	"	351.55	"	Front st....	2 43	853 00
5717	" 30	"	329.1080	"	"	1 93	636 01
5723	Feb. 6	"	61.1890	"	Hunt st....	2 65	164 15
5724	" 6	"	321.110	"	Front st....	1 93	619 64
5725	" 6	"	431.125	"	"	2 43	1,047 48
5736	Jan. 30	Carlisle...	50.1125	"	Eighth st...	2 75	139 05
5736	" 30	"	2.400	"	Mt. Hope...	2 75	6 05
5745	Feb. 13	Consol'd..	73.	"	Hunt st....	2 65	193 45
5746	" 13	"	50.1310	"	Front st....	1 93	97 76
5747	" 13	"	748.1960	"	"	2 43	1,820 02
5786	" 20	"	178.390	"	"	1 93	343 92
5787	" 20	"	66.300	"	Hunt st....	2 65	175 30
5788	" 20	"	635.685	"	Front st....	2 43	1,543 88
5807	Jan. 16	Kineon...	3.150	Piedm'nt	"	4 00	12 30
5807	" 16	"	12.	Yough..	12th-st. yard	3 00	36 00
5808	" 11	Marmet ..	4.	"	7th and Plum	2 75	11 00
5808	" 23	"	4.	"	"	2 75	11 00
5808	" 23	"	.1800	Coke....	.....	2 75	4 00
3849	Feb. 27	Consol'd..	111.1530	Yough..	Front st....	2 43	271 59
5850	" 27	"	74.1445	"	Hunt st....	2 65	198 01
5851 a	" 26	"	252.805	"	Front st....	1 93	487 14
5851 b	" 29	"	245.990	"	"	1 93	473 80
5852	" 9	Brown....	124.1210	"	"	1 75	218 06
5859	" 5	Consol'd..	462.1605	"	"	2 43	1,124 61
5860	" 5	"	174.870	"	"	1 93	336 66
5861	" 5	"	66.1501	"	Hunt st....	2 65	176 89
5878	" 7	"	2.	"	Mt. Hope...	3 00	6 00
5879	Mar. 12	"	50.295	"	Front st....	1 93	96 79
5880	" 12	"	614.580	"	"	2 43	1,492 72
5881	" 12	"	63.1455	"	Hunt st....	2 65	168 88
5881	" 12	"	1.	"	Hunt-st. tk..	3 50	3 50
5909	Feb. 29	Carlisle...	51.900	"	Eighth st...	2 75	141 49
5921	Mar. 19	Consol'd..	100.	"	Front st....	1 93	193 00
5922	" 9	"	178.910	"	"	2 43	433 65
5923	" 19	"	240.1750	"	"	1 93	464 89
5924	" 19	"	72.1945	"	Hunt st....	2 65	193 38
5948	Feb. 15	Kineon...	12.	"	12th-st. yard	3 00	36 00



Voucher.	Date.	Name.	Tons.	Coal.	Delivery.	Price.	Amount.
5948	Feb. 15	Kineon...	1.	Yough ..	Third-st. res.	\$3 00	\$3 00
5963	" 2	Marmet ..	4.	"	7th and Plum	2 75	11 00
5963	" 19	"	4.	"	"	2 75	11 00
5984	Mar. 28	Brown....	114.	Yough ..	Front st....	2 21	251 94
5984	" 28	"	141.	"	"	1 63	229 83
5984	" 30	"	114.540	"	"	2 21	252 53
5984	" 30	"	142.1100	"	"	1 63	232 36
5984	" 29	"	114.	"	"	2 21	251 94
5984	" 29	"	141.1100	"	"	1 63	229 83
5985	" 19	"	138.1050	"	"	1 63	225 80
5986	" 28	"	55.730	"	Hunt st....	2 45	135 64
5989	Apr. 4	"	407.760	"	Front st....	2 21	900 31
5989	" 4	"	226.1230	"	"	1 63	369 38
5990	" 4	"	69.455	"	Hunt st....	2 45	169 61
5992	Mar. 21	Carlisle ..	33.1165	Peach Or	Eighth st...	2 75	92 36
5992	" 21	"	1.	Yough ..	Price Hill tk.	3 00	3 00
6003	Apr. 11	Brown....	509.1765	"	Front st....	2 21	1,126 84
6003	" 11	"	171.1290	"	"	1 63	279 78
6004	" 11	"	74.1075	"	Hunt st....	2 45	182 62
6010	" 1	Kineon...	8.	"	12th-st. yard	2 75	22 00
6010	" 1	"	2.150	Piedm't	Front-st shp	4 00	8 30
6014	Mar. 18	Marmet ..	4.	Yough ..	7th and Plum	2 75	11 00
6014	" 22	"	4.	"	"	2 75	11 00
6041	Apr. 18	Brown....	178.995	"	Hunt st....	2 45	437 32
6042	" 18	"	509.410	"	Front st....	2 21	1,125 34
6042	" 18	"	281.890	"	"	1 63	458 76
6052	" 25	"	70.1775	"	Hunt st....	2 45	173 67
6053	" 25	"	214.1450	"	Front st....	2 21	474 54
6053	" 25	"	473.550	"	"	1 63	771 44
6081	May 25	"	234.1460	"	"	2 21	518 75
6081	" 2	"	452 580	"	"	1 63	737 23
6082	" 2	"	83.850	"	Hunt st....	2 45	204 40
6108	" 3	"	95 710	"	"	2 45	233 62
6109	" 9	"	137.180	"	Front st....	2 21	302 97
6109	" 9	"	584 1590	"	"	1 63	953 22
6171	" 16	"	134.1320	"	"	2 21	297 60
6171	" 16	"	501.1590	"	"	1 63	817 92
6172	" 16	"	66.1630	"	Hunt st....	2 45	163 70
6173	" 16	"	2.	"	Eden Pk res.	.....	5 42
6210	" 1	Kineon...	8.450	"	12th st.....	2 75	22 61
6210	" 1	"	2 300	"	Front st. shp	4 00	8 60
6225	Apr. 15	Marmet ..	2.	"	7th and Plum	2 75	5 50
6225	" 16	"	2.	"	"	2 75	5 50
6252	May 23	Brown....	176.770	.....	Front st....	2 21	389 81
6252	" 23	"	519.980	Yough ..	"	1 63	846 77
6253	" 23	"	66.564	"	Hunt st....	2 45	162 39
6299	" 30	"	116 870	"	Front st....	2 21	257 32
6299	" 30	"	635.500	"	"	1 63	1,035 46
6300	" 30	"	86.955	"	Hunt st....	2 45	211 87
6305	June 6	"	148.350	"	Front st....	2 21	327 47
6305	" 6	"	518 1835	"	"	1 63	845 83
6386	" 13	"	144.1550	"	"	2 21	319 95

Voucher.	Date.	Name.	Tons.	Coal.	Delivery.	Price.	Amount.
6386	June 13	Brown ...	612.270	Yough ..	Front st....	\$1 63	\$997 78
6387	" 13	"	63.1845	"	Hunt st....	2 45	156 61
6418	" 20	"	617.1630	"	Front st....	2 21	1,365 37
6418	" 20	"	86.1150	"	"	1 63	141 12
6419	" 20	"	86.1600	"	Hunt st....	2 45	212 66
6456	" 27	"	550.1030	"	Front st....	2 21	1,216 64
6456	" 27	"	194.1700	"	"	1 63	317 60
6457	June 3	Brown....	106.10	"	Hunt st....	2 45	259 71
6466	" 5	"	510.1970	"	Front st....	2 21	1,129 28
6466	" 5	"	323.1020	"	"	1 63	527 32
6467	" 5	"	88.105	"	Hunt st....	2 45	215 73
6470	" 11	"	109.265	"	"	2 45	267 37
6471	" 11	"	467.1580	"	Front st....	2 21	1,033 82
6471	" 11	"	327.1970	"	"	1 63	534 61
6518	" 22	Kineon...	1.	Piedm'nt	Front st. shp	4 00	4 00
6519	" 1	"	2.	"	"	4 00	8 00
6547	July 18	Brown....	522.230	Yough ..	Front st....	2 21	1,153 87
6547	" 18	"	280.1850	"	"	1 63	457 91
6560	May 26	"	4.	"	12th-st. yard	2 50	10 00
6568	Mar. 21-31	Pittsburg.	14.1950	"	Eighth st....	2 50	37 44
6569	April 1-30	"	50.1670	"	"	2 50	127 09
6570	May 2-31	"	53.640	"	"	2 50	133 30
6571	June 1-20	"	61.1820	"	"	2 52	154 77
6610	July 25	Brown....	647.240	"	Front st....	2 21	1,430 14
6610	" 25	"	223.1170	"	"	1 63	364 34
6611	" 25	"	104.1390	"	Hunt st....	2 45	256 50
6615	Aug. 1	"	746.1120	"	Front st....	2 21	1,649 90
6615	" 1	"	236.685	"	"	1 63	385 24
6616	" 1	"	111.320	"	Hunt st....	2 45	272 34
6619	July 28	"	103.720	"	Front st....	2 21	228 42
6620	Aug. 8	"	660.570	"	"	2 21	1,459 23
6620	" 8	"	242.295	"	"	1 63	394 70
6621	" 8	"	146.505	"	Hunt st....	2 45	358 32
6622	" 1	"	91.720	"	Front st....	2 21	201 91
6629	" 15	"	727.580	"	"	2 21	1,607 31
6629	" 15	"	129 780	"	"	1 63	210 91
6630	" 15	"	108.45	"	Hunt st....	2 45	264 66
6631	" 10	"	107.80	"	Front st....	2 21	236 56
6674	July 30	Pittsburg.	70.800	Peach Or	Eighth st....	2 50	176 00
6684	Aug 22	Brown....	498.1090	Yough ..	Front st....	2 21	1,101 78
6684	" 22	"	375.610	"	"	1 63	611 75
6687	" 15	"	156 80	"	"	2 21	344 85
6688	" 22	"	118.160	"	Hunt st....	2 45	289 30
6727	July 18	Kineon...	1.	Piedm'nt	Front st. shp	4 00	4 00
6727	" 18	"	4.	Yough ..	"	2 50	10 00
6777	Aug 29	Brown....	607.420	"	Front st....	2 21	1,341 93
6777	" 29	"	333.880	"	"	1 63	543 51
6778	" 29	"	90.905	"	Hunt st....	2 45	221 61
6779	" 22	"	159.1840	"	Front st....	2 21	353 42
6782	Sep. 5	"	904.1910	"	"	2 21	1,999 95
6782	" 5	"	136.1290	"	"	1 63	222 73
6783	" 5	"	76.1385	"	Hunt st....	2 45	187 90

Voucher.	Date.	Name.	Tons.	Coal.	Delivery.	Price.	Amount.
6850	Sept. 12	Brown....	631.1280	Yough ..	Front st....	\$2 21	\$1,395 93
6850	" 12	"	299.950	"	"	1 63	488 14
6851	" 12	"	95.1660	"	Hunt st....	2 45	234 78
6852	" 12	"	2.	"	Mt. Aub. tk.	3 50	7 00
6864	Aug. 1-31	Pittsburg..	78.600	Peach Or	Eighth st.,..	2 50	195 75
6881	Sep. 19	Brown....	92.720	Yough ..	Hunt st....	2 45	226 28
6882	" 19	"	618.1690	"	Front st....	2 21	1,367 65
6882	" 19	"	286.130	"	"	1 63	466 28
6902	" 19	Kineon...	2.	Piedm'nt	Front-st. shp	4 00	8 00
6948	" 26	Brown....	785.1490	Yough ..	Front st....	2 21	1,736 50
6948	" 26	"	173.1290	"	"	1 63	283 04
6949	" 26	"	89.25	"	Hunt st....	2 45	218 68
6978	Oct. 3	"	577.970	"	Front st....	2 21	1,276 24
6979	" 3	"	411.1680	"	"	1 63	671 30
6980	" 3	"	72.550	"	Hunt st....	2 45	177 07
6980	" 3	"	1.	"	Third st. res.	3 00	3 00
			36,327 <sup>8.93</sup> / <sub>2000</sub>				\$76,541 69

## EXHIBIT B.

CINCINNATI, June 1, 1891.

THE CONSOLIDATED COAL AND MINING COMPANY, City:

*Gentlemen,*—You are hereby notified that the coal being delivered at the Front-street Pumping Station is not satisfactory as to quality, as the services rendered is far from being as it should in comparison to the most of the coal burned. It is worth a certain amount of money per week to run the boilers at this station, and has been demonstrated by years of use almost exactly the weekly expense of running the house when the best second-pool Youghioghenny coal is burned. Your contract is to supply coal of this quality; consequently our expense should average a certain amount per week. Because of furnishing an inferior quality of coal, the expense has been increased until it now shows double the amount of dollars actually necessary for running this house. This can not continue, as bills in such amounts can not be approved in this office.

You will please give this matter your immediate attention and thus avoid complication in the future.

Respectfully yours,

WILLIS P. THARP.

## EXHIBIT C.

CINCINNATI, March 22, 1892.

THE PITTSBURG COAL COMPANY, City :

*Gentlemen*,—Inclosed please find four copies of contract with the Cincinnati Waterworks for coal, which please sign, also the bond attached, and return to this office as soon as possible.

Respectfully yours,

WILLIS P. THARP,

Superintendent and Engineer of Waterworks.

CINCINNATI, March 28, 1892.

THE PITTSBURG COAL COMPANY,

Corner Elm Street and River, City :

*Gentlemen*,—You will please sign the contracts for coal mailed you for signature. This must be done without delay. If you are furnishing the coal, and intend to do so, you will sign and return the contracts to this office. Unless this is done within a reasonable time, we will order the coal elsewhere.

Respectfully yours,

WILLIS P. THARP,

Superintendent and Engineer of Waterworks.

CINCINNATI, April 7, 1892.

THE PITTSBURG COAL COMPANY, City :

*Gentlemen*,—I herewith return you copies of contract, *you having failed to sign them*. You want to sign on the first page, the same as you signed your original proposal, the place that is marked with a cross. You will also want to sign the proposal on the back the same as you did in the original, and in the bond you must fill in the name of the sureties, and also sign the firm's name as a surety. Also, in the individual bond, you must make an affidavit before a notary public that the sureties are worth the face of the bond, and also the bond itself must be signed by the Pittsburg Coal Company, as well as by the sureties.

Respectfully yours,

WILLIS P. THARP,

Superintendent and Engineer of Waterworks.

CINCINNATI, April 8, 1892.

THE PITTSBURG COAL COMPANY,

Corner Elm Street and River, City:

*Gentlemen*,—I once more return your contracts, you having failed to have your sureties qualify as to the face of the bond. You must do this before a notary public, per my letter of April 7th.

Please have this done properly, and do not send them to this office until they are entirely completed. You will find the blank to be signed on the first page of each contract.

Respectfully yours,

WILLIS P. THARP,

Superintendent and Engineer of Waterworks.

CINCINNATI, April 16, 1892.

THE PITTSBURG COAL COMPANY,

Elm Street and River, City:

*Gentlemen*,—I would call your attention to the fact that the City Auditor will refuse to pay any bills to your firm for coal delivered before the signing of your contract. These contracts have been in your possession for some time. You certainly understand and appreciate the situation.

Respectfully yours,

WILLIS P. THARP,

Superintendent and Engineer of Waterworks.

CINCINNATI, May 3, 1892.

THE PITTSBURG COAL COMPANY,

Elm Street and River, City:

*Gentlemen*,—Inclosed please find your bills returned. We have no contract with you. We have endeavored to get one signed by you on several occasions, but failed. We can pay none of these bills without a contract.

Respectfully yours,

WILLIS P. THARP,

Superintendent and Engineer of Waterworks.

CINCINNATI, June 1, 1892.

THE PITTSBURG COAL COMPANY,

Elm Street and River, City:

*Gentlemen*,—There is no excuse for the long delay in the signing of contract for coal on the part of your company. You will please attend to this matter at once or we will be compelled to take positive



action in the matter. You have already placed yourselves in a position in which you will have trouble in the collection of your bills. I can not understand this negligence and carelessness on your part.

Respectfully yours,

WILLIS P. THARP.

Superintendent and Engineer of Waterworks.

CINCINNATI, June 6, 1892.

THE PITTSBURG COAL COMPANY,

Corner Elm Street and River, City :

*Gentlemen*,—Inclosed please find copy of your contract with the Cincinnati Water Department for furnishing coal for Price-Hill Pumping Station.

Respectfully yours,

WILLIS P. THARP,

Superintendent and Engineer of Waterworks.

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## SPECIFICATIONS, PROPOSALS, and CONTRACTS FOR COAL.

### EXHIBIT D.

#### SPECIFICATIONS

For delivery to the several pumping stations, for the year ending May 1, 1891, of lump or nut coal, of good quality, for steaming purposes, of which 30,000 tons, more or less, are to be delivered at the Front-street Pumping Works, in quantities as directed by the Superintendent; 3,000 tons, more or less, to be delivered at Hunt-street Pumping Works, in quantities as directed by the Superintendent; and 600 tons, more or less, at Price-Hill Works, in quantities sufficient for daily consumption.

1. Bidders will name the kind of coal, and if possible give comparative value of their coal to the second-pool Youghiogheny coal.
2. The contractor is required to begin delivering the coal on the day of the award of contract, and continue the delivery of same in the orders and quantities above named.
3. Said coal to be weighed upon the City Waterworks' scales at said pumping houses.

4. No coal that is mixed with slack, slate, water, snow, or ice will be received.

5. The Engineer of Waterworks shall cause rigid examination to be made of the coal as it is received, and shall have power to refuse any coal which does not conform to stipulations of contract, that contains slack or slate in undue quantities, or has the appearance of qualities inferior to specifications, or is unsatisfactory in any particular, and shall compel the contractor or contractors to furnish an acceptable quality therefor.

6. Bids will be received at rate per ton of two thousand pounds.

7. A bond, with two responsible sureties, will be required for the faithful performance of the above-named conditions.

8. Payments to be made on delivered quantities, approved by the Superintendent of the Waterworks.

9. Bids will be required for each bid separately.

[Signed]

.....  
Sup't and Engineer of City Waterworks.

CINCINNATI, ..... 188

This Agreement, made this.....by and between the city of Cincinnati, of the first part, and W. H. Brown & Sons, of the second part, witnesseth:

1. The said parties of the second part, for and in consideration of the covenant and agreements hereinafter set forth, to be kept and performed by the said party of the first part, hereby covenant and agree to and with said party of the first part to furnish and deliver to the said party of the first part, in such quantities and at such times as the Board of Public Improvements of said city may order, all of the coal as provided for in this proposal. Thirty thousand tons, more or less, second-pool Youghiogheny coal at Front-street Pumping Station, at \$1.87 per ton, and 3,000 tons, more or less, second-pool Youghiogheny coal, at \$2.35 per ton, at Hunt-street Pumping Station, as directed by the Superintendent.

2. In consideration of the above agreements the said party of the first part hereby agree that it will buy, to the extent bid for at the above rates, from the said party of the second part the entire 30,000 tons, more or less, for Front street Pumping Station, and 3,000 tons, more or less, for Hunt-street Pumping Station, as their needs demand, for daily use by the Waterworks Department of said city.

In witness whereof, the said city of Cincinnati has caused her name and corporate seal to be hereunto affixed by President of Board

of Public Improvements, thereunto duly authorized, and the said party of the second part have hereunto set their hands and seals on the day and year aforesaid.

WITNESS :

.....  
Pres't Board of Public Affairs.  
.....  
.....

TO THE HONORABLE BOARD OF PUBLIC AFFAIRS:

*Gentlemen,*—.....will furnish and deliver, in accordance with accompanying specifications, the following:

30,000 tons second-pool Youghiogheny coal for Front-st. Works, \$1 87 per ton  
3,000 tons second-pool Youghiogheny coal for Hunt-st. Works, \$2 35 per ton  
.....tons .....coal for Price-Hill Works, ....per ton

Respectfully,

....offer as sureties:

..... Bidder.

## EXHIBIT E.

### SPECIFICATIONS

For the best quality of lump or nut coal, of good quality, for steaming purposes, .....tons to be delivered at the Front-street Pumping Works, in quantities as may be necessary or ordered by the Waterworks Department, and also to be delivered at Hunt-street Pumping Works, in quantities as may be necessary or ordered by the Waterworks Department, in quantities sufficient for daily consumption, during the period of one year from the date of award.

1. Bidders will name the kind of coal, and if possible give comparative value of their coal to the second-pool Youghiogheny coal.

2. The contractor is required to begin delivering the coal on the day of the award of contract, and continue the delivery of same in the orders and quantities above named.

3. Said coal to be weighed upon the City Waterworks scales at said pumping houses.

4. No coal that is mixed with slack, slate, water, snow, or ice will be received.

5. The Engineer of Waterworks shall cause rigid examination to be made of the coal as it is received, and shall have power to refuse

any coal which does not conform to stipulations of contract, that contains slack or slate in undue quantities, or has the appearance of qualities inferior to specifications, or is unsatisfactory in any particular, and shall compel the contractor or contractors to furnish an acceptable quality therefor.

6. Bids will be received at rate per ton of two thousand pounds.

7. A bond, with two responsible sureties, will be required for the faithful performance of the above-named conditions.

8. Payments to be made on delivered quantities, approved by the Superintendent of the Waterworks, at the end of each week.

[Signed.]

.....  
Sup't and Engineer of City Waterworks.

CINCINNATI, ..... 188

This Agreement, made this.....by and between the City of Cincinnati, of the first part, and The Consolidated Coal and Mining Company, of the second part, witnesseth:

1. The said parties of the second part, for and in consideration of the covenant and agreements hereinafter set forth, to be kept and performed by the said party of the first part, hereby covenant and agree to and with said party of the first part to furnish and deliver to the said party of the first part, in such quantities and at such times as the Board of Administration of said city may order, all of the coal as provided for in this proposal.

2. In considerations of the above agreements the said party of the first part hereby agree that it will buy, to the extent bid for at the above rates, from the said party of the second part, The Consolidated Coal and Mining Company, all the coal necessary for daily use by the Waterworks Department of said city of Cincinnati, Hamilton County, Ohio, provided same be of quality provided for by specification.

In witness whereof, the said City of Cincinnati has caused her name and corporate seal to be hereunto affixed by President of Board of Administration, thereunto duly authorized, and the said party of the second part have hereunto set their hands and seals on the day and year aforesaid.

[Signed]

JOHN FREY,

Vice-President Board of Public Affairs.

THE CONSOL'D COAL & MINING CO.

By JAS. D. HURD, Secretary.

WITNESS: GEO. E. RENOIR.

TO THE HONORABLE BOARD OF PUBLIC AFFAIRS:

*Gentlemen,*—We will furnish and deliver, in accordance with accompanying specifications, the following:

.....tons Youghioghenny second-pool coal for Front-st. Works, \$2 43 per ton  
 .....tons Youghioghenny second-pool coal for Hunt-st. Works, \$2 65 per ton  
 .....tons ..... coal for Price-Hill Works, .....per ton

Respectfully,

THE CONSOL'D COAL & MINING CO.

By JAS. D. HURD, Secretary.

We offer as sureties: ALEX. McDONALD, SOL. P. KINEON.

Bond in sum of \$10,000 signed by Sol. P. Kineon and W. Austin Goodman without date; date of contract blank in bond.

Approved as sufficiency of sureties by D. W. Brown, City Auditor, July 11, 1891. Sureties make affidavit as to having \$10,000, July 16, 1891.

## EXHIBIT F.

### SPECIFICATIONS

For the best quality second-pool Youghioghenny screened lump and best quality Youghioghenny slack coal, for steaming purposes, to be delivered at the Front-street Pumping Works, in quantities as may be necessary or ordered by the Waterworks Department; to be delivered at Hunt-street Pumping Works, in quantities as may be necessary or ordered by the Waterworks Department; at Price-Hill Works, in quantities as may be necessary or ordered by the Waterworks Department, during the period of one year from date of award.

1. Bidders will name the kind of coal, and if possible give comparative value of their coal to the second-pool Youghioghenny coal.

2. The contractor is required to begin delivering the coal on the day of the award of contract, and continue the delivery of same in the orders and quantities above named.

3. Said coal to be weighed upon the City Waterworks scales at said pumping houses.

4. No coal that is mixed with slack, slate, water, snow, or ice will be received.

5. The Engineer of Waterworks shall cause rigid examination to be made of the coal as it is received, and shall have power to refuse



any coal which does not conform to stipulations of contract, that contains slack or slate in undue quantities, or has the appearance of qualities inferior to specifications, or is unsatisfactory in any particular, and shall compel the contractor or contractors to furnish an acceptable quality therefor.

6. Bids will be received at rate per ton of two thousand pounds.

7. A bond, with two responsible sureties, will be required for the faithful performance of the above-named conditions.

8. Payments to be made on delivered quantities, approved by the Superintendent of the Waterworks, at the end of each week.

[Signed]

WILLIS P. THARP,

Sup't and Engineer City Waterworks.

CINCINNATI, .....1892.

This Agreement, made this.....by and between the City of Cincinnati, of the first part, and W. H. Brown & Sons, of the second part, witnesseth:

1. The said parties of the second part, for and in consideration of the covenant and agreements hereinafter set forth, to be kept and performed by the said party of the first part, hereby covenant and agree to and with said party of the first part to furnish and deliver to the said party of the first part, in such quantities and at such times as the Board of Administration of said city may order, all of the coal as provided for in this proposal.

2. In consideration of the above agreements the said party of the first part hereby agree that it will buy, to the extent bid for at the above rates, from the said party of the second part, W. H. Brown & Sons, all the coal and slack necessary for daily use by the Waterworks Department of said city for Front-street Pumping Station and Hunt-street Pumping Station, provided same be of quality provided by specification, and provided same be provided in quantities as may be necessary and ordered.

In witness whereof, the said City of Cincinnati has caused her name and corporate seal to be hereunto affixed by President of Board of Administration, thereunto duly authorized, and the said party of the second part have hereunto set their hands and seals on the day and year aforesaid.

[Signed]

T. W. GRAYDON,

President Board of Administration.

WITNESS:

W. H. BROWN & SONS,

Per J. P. BAUER, Agent.

CINCINNATI, March 15, 1892.

TO THE HONORABLE BOARD OF ADMINISTRATION:

*Gentlemen*,—We, the undersigned, will furnish and deliver, in accordance with accompanying specifications, the following:

Best quality second-pool Youghiogheny lump coal for Front-street Works.....	\$2 21 per ton.
Best quality Youghiogheny slack coal for Front-street Works,	\$1 63 per ton.
Best quality second-pool Youghiogheny lump coal for Hunt-street Works,.....	\$2 45 per ton.
.....coal for Price-Hill Works ....	per ton.

It is reserved that our bid on Front-street Works shall be accepted as a whole, and not for either coal or slack separately.

Respectfully,

[Signed] W. H. BROWN & SONS,  
Per J. P. BAUER, Agent.

We offer as sureties: WM. PURVIS, EZRA GREENWALD.

## EXHIBIT G.

CINCINNATI, July 14, 1891.

THE CONSOLIDATED COAL AND MINING COMPANY, City:

*Gentlemen*,—Inclosed please find copy of your contract for furnishing coal for the Water Department.

Yours truly,

WILLIS P. THARP,  
Superintendent and Engineer of Waterworks.

CINCINNATI, March 22, 1892.

W. H. BROWN &amp; SONS, City:

*Gentlemen*,—Inclosed please find four copies of contract with the Cincinnati Waterworks for coal, which please sign, also the bond attached, and return to this office as soon as convenient.

Respectfully yours,

WILLIS P. THARP,  
Superintendent and Engineer of Waterworks.

CINCINNATI, March 28, 1892.

W. H. BROWN & SONS, City :

*Gentlemen*,—You will please sign the contracts for coal mailed you for signature. This must be done without delay, as it is unnecessary to waste time as in the past discussing the question. If you are furnishing the coal and intend to do so, you will sign and return contracts to this office. Unless this is done within a reasonable time, we will order the coal elsewhere.

Respectfully yours,

WILLIS P. THARP,

Superintendent and Engineer of Waterworks.

CINCINNATI, April 5, 1892.

W. H. BROWN & SONS, City :

*Gentlemen*,—Inclosed please find copy of your contract with the Waterworks Department for coal.

Respectfully yours,

WILLIS P. THARP.

Superintendent and Engineer of Waterworks.

## EXHIBIT H.

CINCINNATI, April 28, 1891.

CONSOLIDATED COAL AND MINING COMPANY,

Mitchell Building, City :

*Gentlemen*,—You are hereby notified that the quality of coal being delivered by you under your contract is very inferior to the quality contracted for; consequently you will please change at once your delivery to the best quality of second-pool Youghiogheny lump coal.

You have been verbally notified in the past that the coal being delivered was not up to the standard, and the time has now come when a change must be made, or I will be compelled to approve your weekly bills not according to the number of tons delivered at the price per ton under your contract, but according to the service rendered because of the poor quality of coal being delivered. The bills are some \$800 per week in excess of what they should be if the proper coal was delivered.

This matter is one that will not admit of any delay. Unless the quality of coal improves at once I will be compelled to purchase coal from other parties.

Respectfully yours,

WILLIS P. THARP,  
Superintendent and Engineer of Waterworks.

CINCINNATI, August 15, 1892.

W. H. BROWN & SONS,

Corner Front and Lawrence Streets, City:

*Gentlemen*,—Your attention is called to the fact that during the past several days you have been delivering at Front Street a quality of coal inferior to that called for by the specifications.

While we do not wish any trouble, and are sorry that we are compelled to object to the inferior quality that is being delivered, yet the subject of the quality of coal is one not to be discussed from day to day, and meanwhile the department suffers from the burning of some other coal than the best screened second-pool Youghioghenny lump.

Respectfully yours,

WILLIS P. THARP,  
Superintendent and Engineer of Waterworks.



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